

WIRE

UNMASKING

FEB 2023 ■ THIS IS THE WAY

THE
COMPLICATED
NEW FACE
OF SCI-FI

BY HEMAL JHAVERI

PEDRO
PASCAL



DIARY OF AN ENTREPRENEUR

Immerse Yourself in the Future

AT A TIME WHEN attention spans are shorter than ever, Khalid Al-Muawad has the answer to the question asked by many organizations in the tourism and entertainment sectors: “What can we do to engage our customers?”

As CEO and Co-Founder of Midwam, based in Jeddah, Saudi Arabia, Al-Muawad is using technologies such as holograms, augmented reality, and virtual reality to help trade fairs, historic sites, music venues, and cultural festivals tell unforgettable stories and create immersive experiences that leave lasting impressions on their visitors.

The impact of these experiences can be profound. Al-Muawad says that many people have been moved to tears by some of the immersive content that Midwam produces.

“

By being innovative and creative, we can revolutionize the way people engage with art, heritage, and culture.

”

Khalid Al-Muawad
CEO and Co-Founder of
Midwam



“To touch someone’s emotions that way is the strongest engagement that we can imagine,” he says. “It is testimony to the technology we use and the power of the story we create working hand in hand with each other.”

Organizations in the cultural and tourism sector are deploying Midwam’s innovations to reinvent the way they connect with guests and potential visitors around the world. While trade missions to other countries can be notoriously dry affairs, Midwam has been able to brighten many a delegate’s day by giving them an incredible walk-through 3D visit through some of Saudi Arabia’s historic UNESCO sites. “One foreign minister was so impressed by the [virtual] ancient tombs of AlUla that he visited the real site a couple of months later,” Al-Muawad says.

With that sort of emotional impact, it is no surprise that demand for Midwam’s immersive experiences is surging. The company has developed unique

Harnessing the power of innovations such as AR and VR, Khalid Al-Muawad’s technology company Midwam is transforming the visitor experience of art, history, and culture, taking customer engagement to a new level.

activations for clients that include a major local airline and the Middle East’s largest music festival, where it designed five separate experiences using holographs and projection mapping. “Rather than just standing around a stage, people were able to embark on a journey and enjoy a new form of experiential entertainment,” Al-Muawad says.

“The new generations are no longer interested in static content and passive experiences. With immersive technologies, we can change the mood and create a whole new level of customer engagement.”

What impact does Midwam make on people?

Every brand has a story. That story for us is the most valuable thing to start with. We amplify the story. That is why our clients like to work with us. They see us transforming their story into an experience, a journey, an interactive masterpiece, an environment where people can engage more with the brand. Engagement makes a major difference to the customer experience and to customer satisfaction.

In a retail space, people only engage for six to nine seconds before they move on. With us, engagement is over two minutes. That is a huge difference from a brand engagement point of view. We use the technology that is right for the brand, and we provide an opportunity for people to further understand the brand's story.

What sort of feedback do you get?

Our immersive experiences intrigue people. Everyone wants to learn more. A person going into an art exhibit may know nothing about the art, and then when we give them a tool for engaging with the pieces, they understand it and appreciate the story more. Most of our work is focused on temporary experiences—they may last for a day or two or for a few months, and then disappear.

What technologies do you use, and how do you choose them?

It depends on the experience that we design. They include artificial intelligence, RFID chips, robotics, interactive haptics, holograms, holographic screens, virtual reality, and augmented reality.

We always say that the immersive business is first based on the story. Only once we understand the story do we select the technology for the experience. The technology depends on the story and enables people to become more immersed and engaged.



Midwam brought the ancient Saudi site of AIUla to life

What are the main challenges when it comes to engaging people?

Studying how people behave and interact. Attention spans are short today, and people do not have much patience. The challenge is to be highly innovative and creative in the use of technology, content, and storytelling. We want to engage people who have “been there and done that.” If you give a child a tablet with static content, they will not want it. Young people are growing up with these technologies. We need to complement the technologies and focus on storytelling, content, and design.

How fast is Midwam growing?

We started in 2012 with about four to six people. We began by educating people about the business and the technology. We now have 30 people. In our business, it is not easy to retain talent, but we have done well. Because of the economy, everyone is competing for designers, developers, programmers, coders, and strategists. We have a lot of colleagues who have been with us from the beginning. We have a great culture. That makes it easy for people to stay. We are extremely lucky to have the people we have. By keeping our culture, we are going to attract even more talented people.

What other opportunities do you see in the future?

We are not limited to tourism. We also work with the entertainment sector to increase engagement. In the future, I am interested in seeing how the metaverse will develop for retail businesses and for financial services, and seeing how the metaverse will impact heritage, culture, and art. At Midwam, we designed an entire environment for a metaverse six years ago. So we are ready. For now, we are extremely focused on the huge number of activations in Saudi Arabia, but I believe that, in time, we will be adding value on international projects in other countries.



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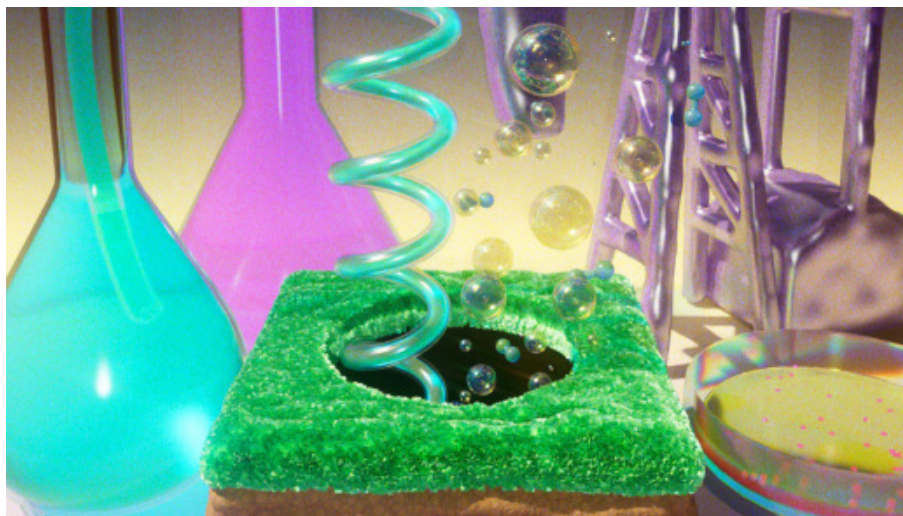
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When we say “complicated new face of sci-fi,” one element we’re referring to is the tension between the gritty, violent figures Pedro Pascal embodies in his roles and the extraordinarily affable, empathetic person he really is. According to Los Angeles-based photographer **Peter Yang**, this dichotomy was evident during the shoot: “Visually, we were going for moody lighting, and Pedro really played well to the different setups, going from funny to dramatic in a blink of an eye. He was cracking us all up.”

Styling by Fabio Immediato. Styling assistance by Asmae El Ouariachi. Grooming by Mira Chai Hyde using House of Skuff. Tailoring by Abigail Lewis. Shirt by Brioni.

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The Technology Transforming Farming

AFTER MORE THAN 20 YEARS in some of the world's largest technology companies, Parag Garg was looking for a new challenge. That did not make it any less of a surprise when in early 2021, he took a phone call from Scott Wine, CEO of agricultural and construction equipment manufacturer CNH Industrial.

"I hadn't thought of agriculture until Scott reached out and I reflected on my personal missions," Parag says. "People don't appreciate how much tech is used in agriculture. It felt like a natural fit. Nearly two years into the job, it is one of the best decisions I have ever made."

As Chief Digital Product Officer at CNH Industrial, Parag is developing precision technologies that help farmers improve the yields on their crops and run their farms more efficiently, profitably, and sustainably. As the global population tops eight billion, it is a mission that is critical to the future of humanity.

"Every day, I wake up with purpose, because no matter what is happening, we have to feed the world," Parag says.

One of the innovations from CNH Industrial helping to transform agriculture is an automated system for combines. Every 20 seconds, it selects the best action out of 280 million possibilities. Using sensors and cameras,

“

Precision technology enables farmers to lower their input costs, increase their crop yields, and improve their productivity.

”

Parag Garg

Chief Digital Product Officer, CNH Industrial



Raven's Technology fully automates the grain unloading process with a driverless, autonomous tractor.

the technology helps operators increase the quantity and the quality of the crops they harvest. In Canada and Brazil, even experienced drivers have been able to increase their productivity significantly. For novice operators, the improvement is even higher.

How is precision farming changing agriculture?

We are at an inflection point. There is a huge opportunity in terms of what precision technology will do for agriculture. There are more people, less arable land, and fewer skilled workers. There is also a move to reduce pesticides



and fertilizers. Precision technology helps farmers tackle these challenges by using data analysis and machine automation to achieve the highest levels of efficiency, profitability, and yield.

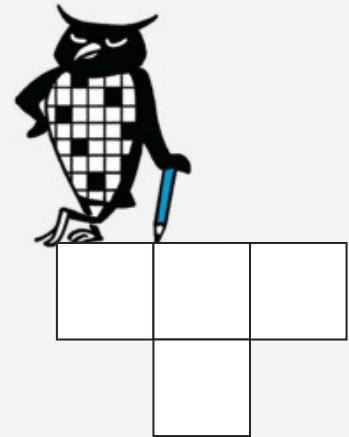
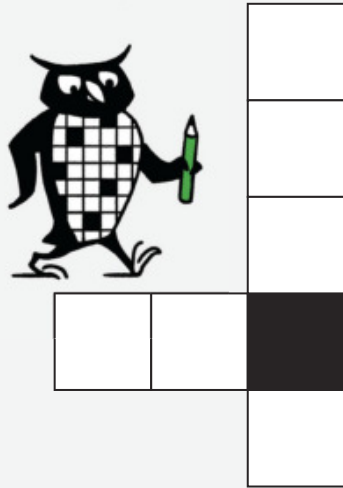
How will automated agricultural vehicles help farmers become more productive?

In August, we unveiled the agriculture industry's first autonomous spreader: the Case IH Trident™ 5550 applicator with Raven Autonomy™. Farmers can use a mobile device to run these driverless machines without an operator present in the cab. By operating at a constant speed and with precision, it delivers the ultimate spreading consistency—without operator fatigue or human error.

Why is demand for automated equipment increasing?

Farmers are looking for autonomous equipment to help solve their labor challenges and increase their productivity. To maximize output, automation and autonomy will be integral. There is a tremendous amount of opportunity to automate repetitive farming operations in the field. Our focus is not to take the farmer out of farming, but to make their machines even more productive. We want our innovations to make life easier and more productive for the world's farmers. In addition, precise and reduced inputs help to reduce environmental impacts and improve sustainability.

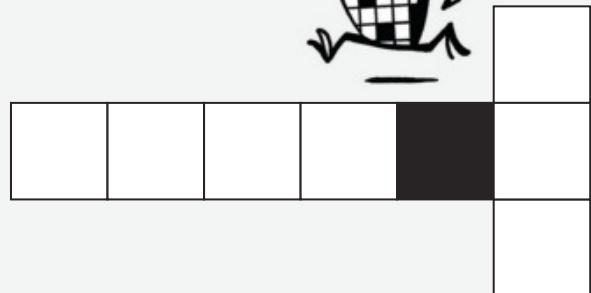
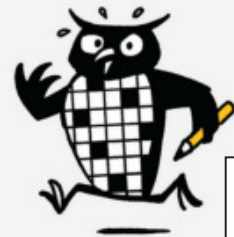
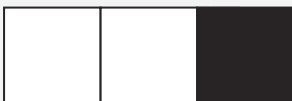
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THE TIME IS RIGHT FOR PORN

Let Twitter be the site it's always been.

OF

ALL THE THREATS posed by Twitter since it fell under sketchy new management in October, one of them doubles as a promise. Twitter will devolve into pornography.

Porn's not my cup of tea, but you have to admire its ferocity and cunning. It's a mega-genre, something the poet-philosopher Timothy Morton might call a hyperobject, ungraspable in its ubiquity and scale. In effect, porn online behaves like a predator plant, saturating the pixels with flesh colors, choking off biodiverse memes, and sowing vast digital acreage with salt.

Tumblr, which started as an artsy microblogging service in 2007, lost its allure when it was overrun by porn five years later. Chatroulette, which was founded in 2009 as a whimsical way to meet strangers, traded its lightheartedness for dick pics and leering goons almost immediately. OnlyFans, which began in 2016 as a platform for performers to post videos, now consists mostly of porn created by sex workers.

But most companies aim to marginalize porn. While OnlyFans has surrendered, Chatroulette and Tumblr appear to take a firmer stand than ever against it. Facebook and YouTube conscript

armies of algorithms and humans to banish porn in deference to advertisers who don't want brands debased by unwholesome adjacencies. Alone among the big social media services, Twitter allows users to post what it calls "intimate media." But the platform also permanently suspends users who post upskirts, creepshots, revenge porn, non-consensual erotica, images shot with hidden cameras, or media accompanied by incitements to violence. Pornographic images, which make up about 13 percent of all tweets, cannot yet be directly sold.

Porn in its place may be bankable, in other words, but too much of it in a venue styled as PG can scare off much bigger revenue streams.

Or so popular wisdom has it. Twitter's new management, as usual, dissents. The volatile Chief Twit, Elon Musk, has torn down guardrails, eliminated moderators, and alienated advertisers all on his own with tiresome shitposting and hospitality to hate speech. Musk, whose personal fortune fell by \$100 billion in 2022, pretends to insouciance about money in a way that's unconvincing and hard to watch. When General Mills, General Motors, Pfizer, Ford, and Mondeléz International (the august maker of Oreos) stopped advertising on Twitter last fall, Musk lashed out at corporate America for its failure to respect the wishes of the founding fathers, who presciently mandated advertising on Twitter in 1789. Unchastened, half of the platform's top 100 advertisers were gone in Musk's first month.

WITHOUT MODERATORS or advertisers, swaths of Twitter are now mangy empty lots crawling with vandals, lechers, con men, and swastikas. The time is perhaps right for porn, then. Porn abhors a vacuum. Especially where it can be ennobled as constitutional duty.

How in the world is this good news? I'll tell you why it's good news to *me*. Not only will it make Twitter2 easily quittable, but it's pleasing to see things become what they deep down are. Twitter has slouched toward porn for years. "Slipping into DMs" is only one salacious meme in what long ago became an orgy of hyperstimulation, with people baring their souls, posting thirst traps, coyly subtweeting, and of course negging and prodding and simultaneously secreting dopamine and cortisol and God knows what other precious bodily fluids.

"I am mad for it to be in contact with me," Walt Whitman wrote, of what he called "life's atmosphere." No doubt he also meant contact with the bodies of the many people he cruised →

Users of Twitter, like consumers of porn, find themselves amused and stimulated, then scroll compulsively, chasing human connection.

STORIES & SOUNDS FROM AROUND THE WORLD



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WOMEN WHO TRAVEL



LISTEN AND FOLLOW WHEREVER
YOU GET YOUR PODCASTS

and desired. Likewise, Twitter seems to offer contact with *everyone*, and the interface exists to make users mad for contact as it conjures life’s atmosphere of abrasiveness streaked with sweetness. The real Twitter was the friends we made along the way, as someone has surely tweeted.

That’s gone now. When the chief rolls in with tryhard trolling that misses the mark of humor, squealing in annoying feedback loops from his Wall of Sound, the warm chatter among the regulars goes silent. A pall falls. When Musk tweeted some horror fiction alleging that the spouse of a prominent elected official might have been perversely complicit in cracking his own skull with a hammer, something at the heart of Twitter seemed to die. Later, when he belatedly followed that Twitter in 2020 had abridged the constitutional right of trolls to post a Hunter Biden dick pic, another influx of refugees poured into Mastodon, which presents itself as a more normal haven for people fleeing Twitter.

“THE INTERNET Is for Porn” was the catchiest song from *Avenue Q*, which debuted 20 years ago. That was before broadband, before social media, before the hijack of information space by influence operations and strongman solo acts like GOP trinity Kanye, Elon, and Trump. It was axiomatic back then. Porn was the internet’s reason for being, its prime directive. And it would have stayed that way had web information not been domesticated by corporations that wanted to hack our worldviews and pick our pockets for data, attention, and mobile payments.

But through all this, Twitter has retained the spirit of porn. Like porn, Twitter is not a family affair; for many, it’s also a shameful habit that they’re forever trying to quit. Since 2007, I’ve turned to Twitter to—the only word I can think of is *learn*. But I know its traps well. Users of Twitter, like consumers of porn, find themselves amused and stimulated, and then scroll compulsively, chasing the dragon of human connection, only to find themselves scrolling through doom, and finally scrolling *for* doom.

WIRED	TIRED	EXPIRED
Cocaine Bear	The Revenant	Grizzly
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Nuclear fusion (for real this time?)	Nuclear fusion	Nuclear fusion
Magic Avatars	Anime blush	Duck face
Cassette	Vinyl	CD

Information may or may not want to be free, but it often wants to be porn. What Musk has considered doing, according to various reports, is introduce paywalled video that would allow performers to get paid while Twitter takes a cut. Sound at all familiar? It’s the OnlyFans model, complete with a rip-off of the OnlyFans interface. The performers it’s tailor-made for are not, as it happens, cellists or mimes. They’re sex workers. And for discerning high rollers who prefer the backroom to the club, Musk has floated the idea of offering paid DMs—to be slipped into as usual, but for a fee. The online-porn business demands extreme discipline to keep it from turning criminal and leaves room for little else, but edgelord Musk is likely to fare better in the demimonde than he is on the main stage.

At the very end of 2022, NSFW content was the fastest-growing sector of English-language Twitter. It’s the way of the world, especially without diligent moderation. At the same time, the new louche Twitter comes with a harum-scarum idea of “free speech” as singularly applicable to obscene provocateurs like Jordan Peterson and Marjorie Taylor Greene, formerly banned figures who were warmly welcomed back to the site in November. “This is a battle for the future of civilization,” the Chief Twit tweeted. “If free speech is lost even in America, tyranny is all that lies ahead.”

If Twitter is going to prey on users with hyper-arousing material and the illusion of intimacy, why not go all the way? Twitter should admit what it’s up to, tell risk-averse advertisers to go blow if they’re prudes, and turn full red-light district. It might scare away the squares, but Twitter can charge a mint for spank-bank material, and a premium for the kind that somehow prevents tyranny. ■

VIRGINIA HEFFERNAN (@page88) is a regular contributor to WIRED and is the author of *Magic and Loss: The Internet as Art*.

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Learn how today's tech shapes our lives.



**LISTEN AND FOLLOW
WHEREVER YOU
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GOD DID US A FAVOR BY DESTROYING TWITTER

Remember what happened with the Tower of Babel?
Same type of deal.

"HAPPY TO TALK about it if this is interesting," Marc Benioff, the founder of Salesforce, texted Elon Musk last spring. He continued, opaquely: "Twitter conversational OS—the town-square for your digital life." This is how billionaires communicate: in slogans, brand identities, and occasional large sums. It's up to everyone else to figure out the details.

"Well I don't own it yet," Musk replied. (To be fair, he was fielding a lot of texts at that moment.) But then he did own it, and by winter the Twitter takeover was a giant, thorny public mess. Whatever magic spell kept people together on the platform seemed to have broken. It was like the plot of *Encanto* without the happy ending: "The graveyard for your digital life."

Twitter's troubles are due not just to Musk, who appears to be both shooting himself in the foot and cauterizing the wound with his own brand of flamethrower. No, Musk is merely the

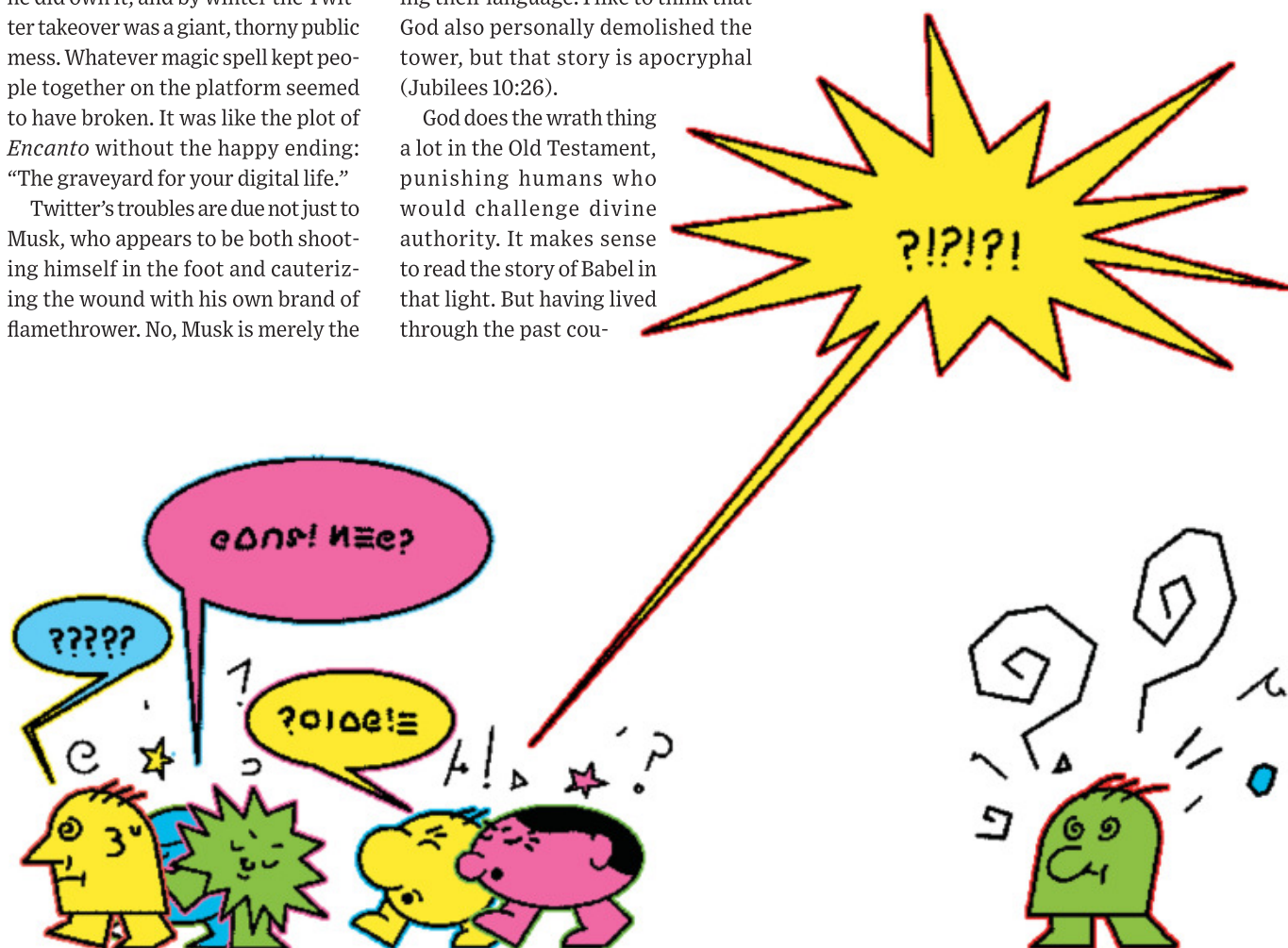
vehicle. The real reason Twitter lies in ruins is because it was an abomination before God. It was a Tower of Babel.

People usually interpret Genesis 11:1–9 as a mythological explanation of why we have so many tribes, so many languages. The story goes that the descendants of Noah were living in Shinar, all speaking one tongue, and decided to build a skyscraper that would let them walk straight into heaven. God went *Not in my backyard!* and scattered the people, confounding their language. I like to think that God also personally demolished the tower, but that story is apocryphal (Jubilees 10:26).

God does the wrath thing a lot in the Old Testament, punishing humans who would challenge divine authority. It makes sense to read the story of Babel in that light. But having lived through the past cou-

ple decades of the internet, I believe the story carries a different lesson. I'm an atheist, so take this theory with a grain of salt, or maybe even a pillar: God wasn't keeping us out of heaven, smiting us for our arrogance. God was protecting us from ourselves.

Every five or six minutes, someone in the social sciences publishes a PDF with a title like "Humans 95 Percent Happier in Small Towns, Waving at Neighbors and Eating Sandwiches." When we gather in groups of more



than, say, eight, it's a disaster. Yet there is something fundamental in our nature that desperately wants to get everyone together in one big room, to "solve it." Our smarter, richer betters (in Babel times, the king's name was Nimrod) often preach the idea of a town square, a marketplace of ideas, a centralized hub of discourse and entertainment—and we listen. But when I go back and read Genesis, I hear God saying: "My children, I designed your brains to scale to 150 stable relationships. Anything beyond that is over-clocking. You should all try Mastodon."

SO PEOPLE ARE fleeing the tower by the millions, or at least shopping the real estate elsewhere—Discord, TikTok, Tumblr, YouTube, Instagram, WeChat, Weibo, Moj. And some are finding their tribes in the Fediverse, the set of decentralized web apps that includes Mastodon.

The Fediverse is, by design, thousands of servers in many languages. They are cheap to run, at least for small groups, and relatively easy to administer. You can chat among your server kin—or blog, or podcast, or share images and videos—and connect with servers in the outside world. The Fediverse apps are all built on a set of rules called the ActivityPub standard, which is a little like HTML had sex with a calendar invite. It's a content polycule. The questions it evokes are the same

as with any polycule: *What are the rules? How big can this get? Who will create the chore chart?*

The true beauty of Mastodon and similar services is that they are designed to collapse. If you want to quit a server, you can take all your followers and follows with you. If a server shuts off, you can find another. It's not *one guy*. It accepts that as we centralize and debate we melt down, and so it comes with a giant sticker that reads: BABEL BUILT IN!

How will these smaller groups of happier people be monetized? This is a tough question for the billionaires. Happy people, the kind who eat sandwiches together, are boring. They don't buy much. Their smartphones are six versions behind and have badly cracked screens. They fix bicycles, then they talk about fixing bicycles, then they show

their friend, who just came over for no reason, how they fixed their bicycle, and their friend says, "Wow, good job," and they make tea. That doesn't seem like enough to build a town square on.

But someone will figure out the details. The reason the Babel story matters is not that it happened once but that it happens over and over: We Babelize and de-Babelize. The internet is an engine of both processes. Eventually, brands will find purchase in Mastodon's rocky soil and grow engagement. Billionaires will order the construction of new marketplaces of ideas. Everything will centralize again, and it will seem eternal, as if the tower could never fall. For now, let's enjoy the scattering. ▣

PAUL FORD (@ftrain@tilde.zone) is a writer, programmer, and software entrepreneur. He lives in Brooklyn.

We Babelize and de-Babelize. The internet is an engine of both processes.



DRIP, BABY, DRIP

**To produce pure hydrogen,
just inject the right microbes
into depleted oil wells.**

**The technique could help
fuel a zero-carbon future.**

THERE WAS NO prospect of pumping more oil out of the old well. It was just a depleted cavern deep beneath the sun-baked Texas soil. But in July, some folks from a Houston-based biotech firm called Cemvita Factory came along and squirted a liquid into it. When they returned five days later, it was no longer an oil well—it had transformed into a hydrogen production plant.

The liquid they spritzed down the bore hole was a carefully mixed cocktail of bacteria and nutrients. Once inside the well, the microbes began breaking down residual oil hydrocarbons—dregs that would be unprofitable to extract—in order to produce hydrogen and carbon dioxide. This field test, though small in scale, was a “huge success,” says Cemvita’s chief business officer, Charles Nelson, who would not comment on the specific bacteria and nutrients the company uses.

Hydrogen releases zero carbon emissions when burned and has long been touted as a future fuel. It’s also the most abundant element in the universe, but here on Earth most of it is bound up in water and other molecules, which means unlocking large quantities is not a sim-

ple operation. There are so many techniques currently vying for supremacy that people have taken to color-coding them: When renewable energy is used to split water molecules into oxygen and hydrogen, that’s called green hydrogen. Blue hydrogen, meanwhile, involves extracting the element from natural gas. Cemvita describes its product as gold hydrogen—“to pay homage to the past era of oil as the black gold and it now being used as a feedstock to make subsurface hydrogen,” says cofounder and CEO Moji Karimi.

Cemvita aims to extract hydrogen from defunct oil wells for \$1 per kilogram, which is on par with other relatively low-cost techniques. Nelson estimates there are more than 1,000 depleted oil wells in the US that are suitable for the company’s microbial treatment: “A lot of these reservoirs are abandoned and in the custody of the state, waiting to be cleaned up.” Existing infrastructure that was used during oil production to capture gases could be brought back into service to collect the hydrogen, he adds.



But containing the CO₂ byproduct remains a challenge, and it could leak into the atmosphere and contribute to climate change. Cemvita claims it can keep the CO₂ locked underground, use other microbes to fix it somehow, or find commercial applications for the gas. Sequestering it may face roadblocks, however. A major blue hydrogen project in Louisiana is currently on hold due to opposition over a plan to store CO₂ beneath a lake; some residents fear it could pollute local water resources.

Plus, while microbes can help produce hydrogen, they might also eat it, says Jon Gluyas, a geologist at Durham University who is investigating subterranean hydrogen sources. “We’re trying to keep bacteria away from our hydrogen because they love feasting on it,” he explains.

Gluyas also argues that actual gold hydrogen is different from the product Cemvita is proposing. To him, that term refers to hydrogen that has been produced naturally underground. And Gluyas should know—“I named it,” he says. That Cemvita has given the same name to its hydrogen is just a “coincidence,” according to Karimi.

For more than a century, geologists have pondered how much natu-

ral hydrogen could be freely available. The German scientist Ernst Erdmann described in 1910 how he had detected an outflow of the gas at a salt mine. But the possibility of widespread subterranean sources remained poorly understood for decades, says Barbara Sherwood Lollar, a geologist at the University of Toronto.

She recalls surveying sites for gases in the 1980s and realizing that significant stores of hydrogen were present in the ground. “Good lord, it was hydrogen. These rocks were full of hydrogen,” she recalls. Since then, Sherwood Lollar and her colleagues have mapped the locations of potential hydrogen sources worldwide.

But given that microbes often gobble up underground hydrogen before anyone has had the chance to siphon it off, finding a large and intact subterranean source is tricky. “No one can pronounce on whether or not these accumulations of hydrogen will be viable at scale,” Sherwood Lollar says.

Some firms are already targeting hydrogen deposits, though. An Australian company with the on-the-nose name Gold Hydrogen estimates that there could be 1.3 billion kilograms of hydrogen about 500 meters beneath the Ramsay Peninsula and Kangaroo Island in South Australia. There is also a large and well-known hydrogen source in Mali. The Australian and Malian deposits are both associated with “fairy circles”—

bare patches in the middle of vegetation where hydrogen is escaping from the ground. Commercial extraction from any such location has yet to happen at scale.

Whether Cemvita’s approach is truly gold hydrogen or not, one advantage of it is that oil wells are reasonably accessible and often located near gas-transport infrastructure. Cemvita is not the only company exploiting these factors. Canadian firm Proton Technologies has demonstrated another technique—which it calls “clear hydrogen”—that involves injecting oxygen into old wells to stimulate a flow of oil and trigger chemical reactions that result in the production of hydrogen and other gases.

Hydrogen production linked to depleted oil wells does have its critics. “I’m skeptical, particularly when you can produce hydrogen quite easily with electricity—it’s just easier,” says Richard Lowes, senior associate at the Regulatory Assistance Project, a clean energy organization. He also argues that such technologies could shore up the fossil fuel industry. After all, if new oil wells can eventually be transformed into green energy sources, they may appear more palatable.

Nonetheless, with multiple ideas for obtaining hydrogen currently jostling for attention—and investment—don’t be surprised to see more techniques added to the extraction rainbow. As Gluyas says: “We’ll probably have more colors than Crown Paints by the end of this process.” ■

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Readout The world, quantified.



9%

↑ Portion of all plastic ever produced that has been recycled. Currently, the US recycles just 5 percent of its plastic waste.

1

↑ Number of employees remaining in late November on the Twitter team that enforces its ban on child sexual abuse material in the Asia Pacific region, home to around 4.3 billion people.

\$2.5M

↑ Estimated total profit made last year by scammers scamming other scammers on online hacker forums and marketplaces.

29

↑ Peak gigawatts of electricity that bitcoin miners in Texas are expected to draw from the state’s energy grid by 2026—four times the peak demand of New York City.



SCALING UP

How one Scottish startup is using data as bait to lure the very analog seafood industry into the 21st century.

THE CHAOS BEGINS at 5 am. The markets open, the traders arrive, and the auction floor heaves. Over the next six hours, gambles are taken, hands are shaken, and deals are made. This old-school scene is how fishers in Europe sell their catch to processors, who then slice, dice, and prepare the seafood for wholesalers, the last-mile delivery companies that supply restaurants, fishmongers, and supermarkets.

Some 140,000 businesses make up the European seafood market, which trades more than \$140 billion worth of fish every year. Despite those high numbers, the industry is mostly offline and resistant to disruption; aside from phone calls and emails, the grandest use of technology may be the occasional WhatsApp message.

Edinburgh-based Rooser aims to push the market into the 21st century, however. Its seafood trading platform connects buyers and sellers across 13 European countries. Following his frustration trying to open a fish factory in Aberdeenshire, Scotland, Joel Watt founded the business in 2019 with Nicolas

Desormeaux, Erez Mathan, and Thomas Quiroga. “You have 35,000 types of seafood products moving on nothing but human emotion with no central price information,” Watt says. “It’s professional gambling: Buying a pile of fish with the hope of quickly selling it—it easily goes wrong.”

As the daily catch moves up the supply chain—from the ocean to the iceboxes at auction to the trucks transporting the goods, and eventually to the dinner table—a piece of fish may change hands seven times. “You have three days to move the fish or you’re dead,” says cofounder Desormeaux, a commercial fish buyer in the French port city of Saint-Malo, Brittany. “Once the truck leaves at midday, you have to wait for the next day.”

Amid the frenzy, mistakes are inevitable. Watt and Desormeaux want Rooser to eliminate the guesswork. “I remember one Saturday night sitting on a harbor wall looking through my contacts, trying to sell 10 tons of mackerel I’d accidentally bought,” Watt says. “Without a communication channel connecting everyone in the chain, you might overpay for a species from the Scottish market, only for its price to plummet once the Danish catch comes in.” And Brexit has added complexity. “It’s introduced layers and layers of paperwork, creating more friction in moving fish between the EU and UK,” he says.

A centralized marketplace doesn’t just benefit seafood traders. Watt says for every two pieces of fish consumed, another never makes it to the plate. By laying out all the information in real time, sales are made faster and less fish goes to waste.

Having secured more than \$20 million in an April funding round, Rooser’s next goal is to scale globally and connect all the players in the supply chain worldwide, down to the individual boats and fisheries. The hope is that the platform could become a sort of Google Maps for the industry. “Every time



Wholesalers have three days at most to ship fresh fish out to stores and restaurants.






Rooser founders Thomas Quiroga, Erez Mathan, Nicolas Desormeaux, and Joel Watt.



By digitally connecting every boat and fishing trip, Rooser aims to build a live map of catches.

a fishing net is taken out of the water, we'd be able to track where it's been and map the ocean where the best fish are at different times of year," Watt says. "We could then provide that data to governments to better manage fish stocks in a data-driven way." The data could also be used to better track each piece of fish, along with its carbon footprint.

Seafood is a traditional business built on long-term connections, but the trade has been relatively quick to adopt Rooser. "An older contact of mine said he would never use technology: 'If you want to sell fish to me, you have to call me every day,'" Desormeaux says. "Now he buys on our platform and tells me to stop calling—he's too busy using our system." Sounds like he's hooked. 

ALEX CHRISTIAN (@alextchristian) is a UK-based culture, technology, and business writer.



Dear Cloud Support:

“Everyone’s so gung ho about therapy these days. I’ve been curious myself, but I’m not ready to commit to paying for it. A mental health app seems like it could be a decent stepping stone. But are they actually helpful?” —Mindful Skeptic

Dear Mindful,

The first time you open Headspace, one of the most popular mental wellness apps, you are greeted with the image of a blue sky—a metaphor for the unperturbed mind—and encouraged to take several deep breaths. The instructions that appear across the firmament tell you precisely when to inhale, when to hold, and when to exhale, rhythms that are measured by a white progress bar, as though you’re waiting for a download to complete. Some people may find this relaxing, although I’d bet that for every user whose mind floats serenely into the pixelated blue, another is glancing at the clock, eyeing their inbox, or worrying about the future—wondering, perhaps, about the ultimate fate of a species that must be instructed to carry out the most basic and automatic of biological functions.

Dyspnea, or shortness of breath, is a common side effect of anxiety, which rose, along with depression, by a whopping 25 percent globally between 2020 and 2021, according to a report from the World Health Organization. It’s not coincidental that this mental health crisis has dovetailed with the explosion of behavioral health apps. (In 2020, they garnered more than \$2.4 billion in venture capital investment.) And you’re certainly not alone, Mindful, in doubting the effectiveness of these products. Given the inequality and inadequacy of access to



affordable mental health services, many have questioned whether these digital tools are “evidence-based,” and whether they serve as effective substitutes for professional help.

I’d argue, however, that such apps are not intended to be alternatives to therapy, but that they represent a digital update to the self-help genre. Like the paperbacks found in the Personal Growth sections of bookstores, such

apps promise that mental health can be improved through “self-awareness” and “self-knowledge”—virtues that, like so many of their cognates (self-care, self-empowerment, self-checkout), are foisted on individuals in the twilight of public institutions and social safety nets.

Helping oneself is, of course, an awkward idea, philosophically speaking. It’s one that involves splitting the self into

two entities, the helper and the beneficiary. The analytic tools offered by these apps (exercise, mood, and sleep tracking) invite users to become both scientist and subject, taking note of their own behavioral data and looking for patterns and connections—that anxiety is linked to a poor night’s sleep, for example, or that regular workouts improve contentedness. Mood check-ins ask users to identify their feelings and come with messages stressing the importance of emotional awareness. (“Acknowledging how we’re feeling helps to strengthen our resilience.”) These insights may seem like no-brainers—the kind of intuitive knowledge people can come to without the help of automated prompts—but if the breathing exercises are any indication, these apps are designed for people who are profoundly alienated from their nervous systems.

Of course, for all the focus on self-knowledge and personalized data, what these apps don’t help you understand is why you’re anxious or depressed in the first place. This is the question that most people seek to answer through therapy, and it’s worth posing about our society’s mental health crisis as a whole. That quandary is obviously beyond my expertise as an advice columnist, but I’ll leave you with a few things to consider.

Linda Stone, a researcher and former Apple and Microsoft executive, coined the term “screen apnea” to describe the tendency to hold one’s breath or breathe more shallowly while using screens. The phenomenon occurs across many digital activities (see “email apnea” and

“Zoom apnea”) and can lead to sleep disruption, lower energy levels, or increased depression and anxiety. There are many theories about why extended device use puts the body into a state of stress—psychological stimulation, light exposure, the looming threat of work emails and doomsday headlines—but the bottom line seems to be that digital technologies trigger a biological state that mirrors the fight-or-flight response.

It’s true that many mental health apps recommend activities or “missions” that involve getting off one’s phone. But these tend to be tasks performed in isolation (pushups, walks, guided meditations), and because they are completed so as to be checked off, tracked, and subsumed into one’s overall mental health stats, the apps end up ascribing a utility value to activities that should be pleasurable for their own sake. This makes it more difficult to practice those mindfulness techniques—living in the moment, abandoning vigilant self-monitoring—that are supposed to relieve stress. By attempting to instill more self-awareness, in other words, these apps end up intensifying the disunity that so many of us already feel on virtual platforms.

Freud once pointed out that new technologies merely solve problems created by other technologies. To the common refrain that without the telephone, we’d be unable to hear the voices of our adult children who live hundreds of miles away, he replied, “If there had been no railway to conquer distances, my child would never have left his native town and I should need no telephone to hear his voice.” Civilization, Freud believed, was nothing more than a repetition compulsion, humanity’s attempt to replicate and reinscribe its fundamental disunity with nature through the very tools that created that alienation in the first place. Psychoanalysis may be a somewhat outmoded therapeutic framework, but it’s one that takes human irrationality seriously, and perhaps offers insight into

the absurd belief that we can use digital tools to solve a health crisis that is, at least in part, exacerbated by them.

I’m not recommending, *Mindful*, that you get “on the couch,” necessarily—rather, that you think about getting off it.

The ordinary, and decidedly contemporary, brand of unhappiness that stems from excessive self-consciousness can be partly dispelled by immersing oneself in a throng of other people. Go to church, or to a 12-step meeting. Join a community sports league or attend a concert. While group activities may not address the underlying cause of your malaise, they will surely offer a reprieve. You’ll momentarily forget your heart rate, your REM stats, and your wellness history and remember the existence of fellow human beings who are suffering, most likely, in similar ways. At some point, I suspect, you’ll find that your breathing is taking care of itself.

Faithfully, Cloud

MEGHAN O’GIEBLYN is the author, most recently, of *God, Human, Animal, Machine*.

↓
Cloud Support:
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For philosophical guidance
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technology, write to
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GEAR

BY THE WIRED REVIEWS TEAM | PHOTOGRAPHS BY CERA HENSLEY

SHAPE SHIFTERS

Whether exercise is already part of your daily routine or you've just embarked on a sweat-based self-improvement plan, this collection of workout gear will help you level up.



◀ On Cloudmonster

These pavement-optimized kicks from the Swiss running gear brand On look ungainly, but they're light and nimble shoes made for runners who need more padding than most models provide. The midsole is thick, with squishy cushioning, and the hollow loops that form the tread pull double duty, adding a burst of springiness while absorbing the injury-causing shocks of each footfall. On longer runs, all that billowy buttressing will make you want to go farther and faster than last time. **\$170**

▼ Coros Apex 2

Smartwatch makers are flooding the zone with more options for hardcore outdoor adventurers, and the rugged Apex 2 is one of our top picks. It connects to all five major GPS satellite systems and can track your location for 45 hours per charge. With GPS off, the battery lasts a full month—wear it all the time and let the LED-powered heart-rate monitor track your sleep along with your workouts. The onboard tools include elevation trackers, GPS checkpoints, and a sunlight tracker to help you reach your destination before dark. It'll even remind you to eat lunch. A stout design and a scratch-resistant coating make it the best wearable for rough-and-tumble activities like bouldering. **\$400**



Skida Throwback Headband ▲

Every serious runner should have a good headband. Even if you don't have flowing Robert Plant locks to hold away from your face, a snugly fitting band keeps the sweat off your brow and the sting out of your eyes on the back half of a 10K. Skida's headbands are made in Vermont from fabric that wicks soft and sop-ready jersey with Spandex, giving each band enough stretch to stay put if you have a lot of hair or need to pull it down over your ears to temper a dawn chill. They come in a staggering array of cute patterns and colors to suit any style. **\$18**

JLab Go Air Sport ▶

We've tested a whole slew of affordable earphones, but these decent-sounding buds from JLab win by virtue of being the best value. The Go Air Sport earphones are the workout-friendly version of the Go Air; they're slightly more expensive (and a little bigger) because of their nicer case and fit-enhancing over-ear hooks. The touch controls are easy to use and not overly sensitive; adjusting your hair or your hat won't accidentally pause Bad Bunny. They last up to seven hours per charge, and the charging case (which has a built-in USB-C cable) provides a solid 24 hours of additional juice. Of course, they're fully sweatproof, so go ahead and do another lap. **\$30**



Apple TV 4K

Maybe you're not ready to go back to the gym. (The only thing worse than running on a treadmill is wearing a mask while doing it.) That's fine, because thanks to Silicon Valley's expansion into fitness tech, it's never been easier to exercise from home. Our favorite way to stream live and recorded workouts is through the Apple TV. Its interface is sleeker than Roku's or Google's, and the device seamlessly connects to other Apple products you already own, so you can use an Apple Watch as a remote or pipe audio directly to a pair of AirPods. Plus, the App Store's fitness selection is rich with choice, with everything from Peloton for cardio and strength training to Glo for yoga, Apple's own Fitness+ (\$10 a month), and even guided meditations, with most of it streamed in 4K. **\$129**





Artilect Flatiron 185 ▲

Merino wool base layers provide supreme warmth and moisture wicking while remaining super thin and light. That's why they're our preferred long-undie material for hiking and camping trips. The problem is that merino doesn't hold its shape when damp, and it isn't durable enough to last more than a few seasons. Artilect's base layers are made with tech called Nuyarn that's showing up in all sorts of outdoor apparel. It uses merino fibers that are spun around a durable synthetic core, increasing the yarn's loft and, therefore, its insulating powers. The resulting garment is warmer, stretchier, faster-drying, and longer-lasting than its peers. **\$150 each (top or bottom)**



Pixel Watch

Despite being fashionably late to the smart-watch party, Google's design chops and recent acquisition of activity-tracker giant Fitbit have resulted in a spectacular debut. With a soft silicone strap and a 41-mm case that's slightly domed on the back, the full-featured Pixel Watch is as comfy to wear during sweaty workouts as a bare-bones activity tracker. It does all the smartwatchy things you'd expect, like notifications, music controls, and contactless payments. Beyond that, the Pixel tracks workouts, monitors fitness with a heart-rate monitor we found to be extremely accurate, and collects health-related data like sleep activity and electrocardiogram readings. Think of it as a super-sleek Fitbit. Just know that the battery needs recharging daily, and the watch works only with Android phones; Apple people, look elsewhere. **\$349 and up**



Upright Go S Posture Corrector ▲

It would be nice if someone followed you around everywhere to alert you whenever you're slouching. The next best thing is the Upright Go S. The little rectangular charm sits on your back, where it's held in place by an adhesive strip or, better, the \$20 necklace accessory. Calibrate the device using its companion app, and when it detects you slouching for a certain amount of time, it vibrates to remind you to straighten up. Change the length and intensity of the alerts within the app. If you just want to see some data on how bad your posture is, you can track your slouching habits without vibrations. Recharge it via USB-C a couple of times a week. Wear it enough and it will cleverly train you to think about your posture even when you're not wearing it. **\$60**

Somnox 2 ▼

Getting enough sleep is key to optimum physical and mental health—you can't perform at your peak when you're tired. But if you can't sleep, there's an array of drowsy devices to help. One of our favorites (and definitely the weirdest) is the Somnox 2. This foot-long, 4-pound robotic bedfellow is designed to be cuddled. Once it's spooned in your arms, the fabric-covered bot plays relaxing sounds as it slowly expands and contracts. These movements, designed to mimic breathing, gradually slow your own inhaling and exhaling as you subconsciously match its rhythm. The bean-shaped buddy definitely helped our tester fall asleep more easily, so we recommend it despite a buggy app and a price that may cause nightmares. **\$599**



▼ Fairdale Weekender Archer

Turn your commute into a low-impact workout by riding a bike instead of taking a bus, train, or Lyft. This Fairdale has all the bike-lane-ready appointments we love: a handlebar that encourages an upright riding position for keeping an eye on traffic, disc brakes that stop quickly in all weather conditions, and enough gears to negotiate hills and sprint in the flats. Its all-steel frame and sturdy components will last through your next few promotions—or employers. Plus, as the bike's name implies, it's just as suited for weekends, with wide tires eager for off-road shenanigans. **\$999**



**Prana Verde ►
Yoga Mat**

Sorry to harsh your post-vinyasa vibes, but there's a dirty secret about most yoga mats: They're terrible for the environment. Mats are typically made from polyvinyl, which is durable and grippy but lousy with polluting petrochemicals. Forward-thinking companies are racing to unroll mats featuring more Earth-friendly compounds. Prana's Verde is our latest favorite. It's made from a blend of recycled and sustainably harvested rubber that provides plenty of grip and cushion. A layer of organic cotton inside helps the 4-mm-thick mat keep its shape well after you've burned through your 30-class pass. The standard Verde is 6 feet long; taller yogis can choose the large (\$110) for an extra 6 inches of deep-breathing room. **\$99**



Shwood Camp Arrowcrest

Cheap sunglasses suck for a number of reasons, from poor fit to a lack of reliable UV protection. These affordable specs from Shwood avoid those pitfalls while classing up your facade with their smart design. The lenses are polarized for better visual clarity during outdoor activities, and they're coated with a reflective compound that provides full UV protection and blocks glare in the snow or at the beach. Metal spring hinges make them more durable and keep them comfortably secure on your temples. The frames are made from natural materials—bioplastic derived from castor seeds, dashes of walnut along the sides—so they won't tick off Mother Nature too much. **\$99**



Yeti Yonder ▼ 1L Water Bottle

The stickers covering your Nalgene bottle say a lot about who you are, but the grotty, scuffed-up bottle itself is probably sending stronger signals. Upgrade your hydration helper by switching to this slim and dishwasher-safe vessel from Yeti—yes, the bougie cooler people sell fancy bottles too. It's made of BPA-free, shatterproof plastic that doesn't get all splintery like other bottles do after too many tumbles. The nicest design touch here is the two-piece leakproof cap: Unscrew the top part to expose the sipping spout, then remove the second cap to refill the bottle, wash it, or chug your water like a beast. **\$28**



COURTESY OF SHWOOD Eyewear, YETI, AND WAHOO FITNESS



◀ Wahoo Elemnt Roam v2

A handlebar-mounted bike computer is a welcome companion on any long trip. We like the newest Roam, which features GPS that operates on two frequency bands instead of one, giving you a clearer signal in woodsy terrain and location data accurate to a few centimeters. Turn-by-turn navigation prompts for all maps—whether preloaded or uploaded via apps like Strava, Komoot, or Ride with GPS—keep you on the trail and can help you get back to your starting point even if the device is offline. The easy-to-read touchscreen also displays speed, miles ridden, how long you've been riding, heart rate (when paired with a heart-rate monitor), revolutions per minute (when paired with a power meter), and more. The battery lasts 17 hours, enough for a crushingly long day in the saddle. **\$399**

Product reviewers: Boone Ashworth, Michael Calore, Julian Chokkattu, Medea Giordano, Parker Hall, Simon Hill, Stephanie Pearson, Adrienne So. For more reviews and buying advice, visit WIRED.com/gear.



◀ Lululemon Metal Vent Tech SS 2.0

Designed for running, team sports, and other intense activities, this lightweight shirt has a mesh construction that keeps things breezy. It's also supremely comfortable for something that's relatively form-fitting. It's made with yarn that's spun from nylon and recycled polyester threads and fashioned into fabric panels through a 3D knitting process. The technique eliminates side seams and makes the shoulder seams much smaller, to minimize chafing. The hybrid yarn also gives the shirt a good amount of stretch—much more than cotton—making it a perfect companion for weightlifting or pickup basketball. **\$78**

MAX LEVCHIN'S WAR ON CREDIT CARDS

The PayPal cofounder on why his “buy now, pay later” company Affirm is a healthier way to borrow, what caused the techlash, and Elon Musk’s Twitter.

MAX LEVCHIN DOESN’T have a problem with the concept of borrowing. An immigrant from Soviet Ukraine, he took out loans to attend college in the US. In his early twenties, he persuaded Peter Thiel to fund the company that became PayPal. Since then, access to cash hasn’t been much of a problem for him. After PayPal, Levchin tapped the funds of Silicon Valley’s fin-

➤ Credit card debt, Levchin says, is “basically a road to hell.”

est investors to build Slide, a suite of photo-sharing widgets that sold to Google, and a fertility-tracking app called Glow. But he kept one foot in fintech, and for the past 10 years has been running a company called Affirm, which takes a new approach to consumer lending. Lots of people, Levchin says, need access to credit. But that doesn’t mean they should use credit *cards*.

I met the 47-year-old founder one day late last year at Affirm’s headquarters in downtown San Francisco. He was wearing his trademark rimless glasses and a polo shirt with the company’s logo. Levchin will talk about credit cards endlessly, and he’ll skillfully bring the conversation back, every time, to how—in a country whose collective credit card bill just took its biggest leap in 20 years, to \$930 billion—Affirm is the solution.

The company was a pioneer of the “buy now, pay later” model in e-commerce: When an online shopper reaches checkout, they can choose to cover their purchase with a short-term loan from Affirm or one of its competitors. (The big ones include AfterPay, Klarna, and most recently PayPal.) A team of AI underwriters instantly reviews the shopper’s financial profile and proposes terms for the loan, which the shopper agrees to pay back in four or more installments. Unlike credit cards, Levchin argues, this system helps discourage people from financially overextending themselves. Affirm makes its money by charging merchants a fee on every transaction and collecting interest from customers with longer-term loans.

It’s perhaps unsurprising that Levchin, a technologist whose career started in the frothy era of overflowing techno-optimism, alongside Thiel and Elon Musk, would believe some form of tech is the cure for society’s financial ills. But can he win converts to buy now, pay later (BNPL) at a time when “later” feels, you know, kind of inauspicious? This conversation has been edited for clarity and length. ➔



I think the reason you agreed to sit down with me is that you want to talk about Elon Musk and Twitter.

No. You've been misinformed.

OK, well, we can come back to Twitter later. For now, let's talk about the economy. You've been running Affirm for over a decade, but BNPL has surged over the past few years. Why?

The full arc of the story is: A bunch of people go bankrupt during 2008 and 2009, and it's a really jarring thing. You then go into a neither-borrow-nor-lend Puritan ethic, Benjamin Franklin-style, pretty quickly. Lots of people who were growing up at that time, basically the millennial generation, woke up and said, "This is pretty crazy. Borrowing sucks." A full generation of people moved away from credit cards to debit cards or cash. The thesis for Affirm was this idea that people need to borrow, and they hate borrowing the way their parents did. We offer

consumers this magical mix where you can borrow money but not feel like it's an accelerating snowball.

I think the pandemic really pushed people into making more essential purchases. When you were in lockdown, you suddenly needed an office and a restaurant and a gym, all within your home—things you would have to borrow for. Most people just don't have enough to buy a \$2,000 workout bike.

We were an "overnight success" in the pandemic in the sense that even though we were growing already, we got to the kind of scale where people noticed.

You just adjusted your financial guidance for 2023. How dire are things?

They're not. It is absolutely true that US ecommerce is slowing down. The good news is that we are still just under 2 percent of US ecommerce; we have lots of room to grow into the numbers that we need to get profitable.

The reason to control costs is that it's easier to stay focused. We've been disciplined enough where I don't believe we need to reduce headcount. But if you're thinking, "Well, I want to launch in every country, and I have these other five crazy things that I'm going to try," then of course you want to hire lots of people. But that means

the overall progress of the company is slower.

Then if you say, "You know what, we want to get profitable, and everything else comes later," you want fewer people. You actually don't want lots of different projects going on.

I can't help but think you're subtweeting a company like Meta right now. It lost \$9 billion in three quarters on the vision of the metaverse while also laying off a lot of staff.

I almost went there. Meta is very, very profitable. It doesn't actually have to lay people off. We'll see what happens at Alphabet, but it's *exceedingly* profitable. And yet a lot of these companies are saying, "Hang on a second, time for a hiring freeze."

For profitable companies, it's not about saving money real quick. They have shareholders pressuring them to keep a bottom line, but fundamentally they're not fighting for their life. They're just trying to get focused.

In our case, we were disciplined before the current interesting times began. We did not massively overhire. We did not have an enormous number of people working on interesting new projects that suddenly became not important. But I do still think it

"There are three ways to lose money: People lie to themselves, people lie to you, and bad things happen to good people."

helps you focus to say, “We’re going to do more with less.” We decided to slow down hiring by a couple hundred heads. We’re an almost 3,000-person company. These are people who could have been here working on interesting new things, and they will be, but probably a year later than I’d want.

I sent a note to employees explaining how we’re thinking about the current times and said, you know, I looked at the idea of a hiring freeze as a possibility, and it just doesn’t make sense. There’s so much stuff that we really have to deliver.

What are those things specifically?

The Debit+ debit card team still needs bodies to go build stuff. It’s one of the coolest things we’ve done in years.

I’m fascinated by our ongoing obsession, particularly in the US, with physical payment cards. [An Affirm public relations executive hands me a plastic Affirm debit card, which links to a person’s existing bank account.]

For us, the reason for cards is simple: It’s just really, really hard to use Affirm offline if you don’t have a physical card. I had dinner out last night, and I can turn it into a payment plan if I want to with this debit card.

Affirm and other BNPL services have come under fire from the US Consumer Financial Protection Bureau because of what is seen as the potential for reckless borrowing.

There are three ways to lose money: People lie to themselves, people lie to you, and bad things happen to good people. People lying to us or lying to a lender is fraud. I think the majority of the industry has gotten good at spotting it. It’s people lying to themselves that’s very difficult. Because someone says, “I’d like to borrow some money, and I’m sure I will win the lottery. I will absolutely pay you back.” And then they don’t, and they’re overextended.

If you underwrite, you can say: “The probability of a lottery win for you is

infinitesimal, and you’re currently overextended. Please pay your bills, and then we’ll have an adult conversation.”

The bad-things-happen-to-good-people cases are unavoidable. People who go from “I’m fine and everything’s OK” to “Oh crap, I got laid off and I can’t pay my bills” are typically great customers. They really do face hardship in very unexpected ways, and that’s not the moment for us to be like, “Oh cool, you lost your job? Let’s get some late fees going here.”

What’s your current default rate?

We have a monthly installment product and a pay-in-four product, which have slightly different loss rates. But the headline number is 3 percent.

What do you make of the fact that people are using Affirm to buy food and gas—turning to BNPL for essentials?

Generally speaking, so long as they’re doing this by replacing credit cards with BNPL, I think that’s very good for society. If you have a bunch of people who say, “I really need to feed my family of six this Thanksgiving and I can borrow money or not feed them,” most people are going to use a credit card. That is basically a road to hell, where you’ll just have a balance forever and ever. And then you’re super in debt and your credit card rates are going up because the Fed is raising the federal funds rate.

BNPL does not get people into trouble, so long as the people doing the lending do their job. In an ideal world, you should be using Affirm to buy groceries. At the very least, you can be sure that you’re not going to pay late fees. More importantly, you won’t have your interest compounded.

People are going to borrow; it’s not a bad thing. I borrowed money to go to college. My family came to the US with \$634 dollars to our name for five

people. And I wouldn’t be here today if I did not have a good computer science degree from a good school. That was all funded by all kinds of loans. And I paid them off eventually, but the only alternative was to not go to school.

Trust is eroding in a lot of our traditional institutions, and there’s been a “techlash” over the past several years. Why would people trust a BNPL service? Is this some version of the way venture capitalists have basically been funding our lifestyles through non-profitable companies like Uber or Lyft or DoorDash?

You can’t build trust from getting on a street corner and saying, “Please trust me!” You have to do it over a decade. Part of why people hadn’t heard of Affirm is that not enough people trusted us. I think our relationships with both the consumer and the merchant are pretty strong. We’re currently at about a million reviews in the Apple App Store, and the majority are five-star reviews.

There’s a boatload of people who are very skeptical about the tech world in general. The reason I keep on saying in earnings calls that we make 3 to 4 percent for every dollar that we help transact is to make the point that we’re not subsidizing. This isn’t a transfer of venture capital into the hands of unsuspecting consumers who are somehow supposed to make us whole eventually. We insist on running a unit economic profitable company. Like, the question to ask Uber is: Do you make money on every ride? If you



—— “I really don’t see Twitter as a source of truth or news or too much useful public debate. I think of it as a torrent of interesting thoughts and opinions. But that’s a personal choice.”

don’t, you are funding people’s need to travel with someone else’s money.

The tech industry used to inspire a lot more optimism than it seems to now. Why do you think that is?

It’s an interesting and probably long conversation. Ten years ago, I think even trillion-dollar companies were perceived as going to elevate a whole generation of people and make everything cheaper and more efficient and easier. Then, 10 years later, the US as a country is less productive. All of this tech was supposed to make us more productive, but it didn’t. So we’re earning, on an inflation-adjusted basis, a lot less. And yet you have people running around with incredible net worths and valuations of companies that are still very, very, very high.

I think, in a world where everyone’s going to win, you could be OK with somebody winning really huge. But 10 years later, well, some people won huge and maybe you’re thinking: “I think I lost. That sucks. I think it’s these companies’ faults.” That’s an unpolished version of the answer.

People fundamentally care about their personal economics. More than even they would like to admit to themselves.

I think that’s true. But when you look at the reaction to Elon Musk taking over Twitter, why do you think it was so strong?

There’s a bunch going on there, and I don’t know if I’ve fully thought it through. I think what’s happening at Twitter is Elon is sort of making sense of it. He’s probably saying, “What are we really working on? Do we have enough earning capacity? Do we have enough advertisers or whatever it is we need to make money?” I haven’t talked to him about it, but—

Do you talk to him?


Yeah.

How regularly?

Regularly-ish? I saw him at the PayPal 25th-reunion party a couple months ago. Our friendship is on a texting basis. We talk about sci-fi and things. We’re both avid science fiction readers.

But yeah, I don’t know if I have a well-formed opinion. I really don’t see Twitter as a source of truth or news or too much useful public debate. I think of it as a torrent of interesting thoughts and opinions. But that’s a personal choice.

My primary use of Twitter is people

complaining to me about some problem and I try to handle it for them. I love customer service work because you get to find out what people are like. People who talk to me on Twitter or email, they’re full-on normal. They’re in places where people need to decide between a couch and a baby carriage, and that’s a bad choice to have to make. And they get angry when they feel we should have taken better care of them. Talking to them gives you a really good idea of what life is like in most places, unlike Silicon Valley. 

LAUREN GOODE (@LaurenGoode) is a senior writer at WIRED covering consumer tech issues.

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GENERATIVE AI CAN NOW MAKE
BETTER ART THAN MOST HUMANS.



ENGINES OF WOW

SOON IT WILL TRANSFORM HOW WE
DESIGN JUST ABOUT EVERYTHING.

by KEVIN KELLY



KEVIN KELLY

(@kevin2kelly) is the founding executive editor of WIRED. He wrote about the mirrorworld in issue 27.03.



PICTURE LEE UNKRICH, ONE OF PIXAR'S MOST distinguished animators, as a seventh grader. He's staring at an image of a train locomotive on the screen of his school's first computer. *Wow*, he thinks. Some of the magic wears off, however, when Lee learns that the image had not appeared simply by asking for "a picture of a train." Instead, it had to be painstakingly coded and rendered—by hard-working humans.

Now picture Lee 43 years later, stumbling onto DALL-E, an artificial intelligence that generates original works of art based on human-supplied prompts that can literally be as simple as "a picture of a train." As he types in words to create image after image, the *wow* is back. Only this time, it doesn't go away. "It feels like a miracle," he says. "When the results appeared, my breath was taken away and tears welled in my eyes. It's that magical."

Our machines have crossed a threshold. All our lives, we have been reassured that computers were incapable of being truly creative. Yet, suddenly, millions of people are now using a new breed of AIs to generate stunning, never-before-seen pictures. Unlike Lee Unkrich, most of these users are not professional artists, and that's the point: They do not have to be. Not everyone can write, direct, and edit an Oscar winner like *Toy Story 3* or *Coco*, but everyone *can* launch an AI image generator and type in an idea. What appears on the screen is astounding in its realism and depth of detail. Thus the universal response: *Wow*. On four services alone—Midjourney, Stable Diffusion, Artbreeder, and DALL-E—humans working with AIs now cocreate more than 20 million images every day. With a paintbrush in hand, artificial intelligence has become an engine of *wow*.

Because these surprise-generating AIs have learned their art from billions of pictures made by humans, their output hovers around what we expect pictures to look like. But because they are an alien AI, fundamentally mysterious even to their creators, they restructure the new pictures in a way no human

A MESSAGE FROM THE WIRED ART DEPARTMENT: Though it was only a matter of time before automation came for creativity, the advent of AI art generators has been divisive in the creative community. Some artists have embraced the new tech; others believe it's #notreal. We at WIRED have spent a lot of time sorting out our own reactions. Undeniably, the technology comes with issues—economic, ethical, legal. At the same time, it expands opportunities for art and artistry. WIRED will always come down on the side of the future. That means encouraging the use of new tools, while refusing to allow those tools to replace human creators.

is likely to think of, filling in details most of us wouldn't have the artistry to imagine, let alone the skills to execute. They can also be instructed to generate more variations of something we like, in whatever style we want—in seconds. This, ultimately, is their most powerful advantage: They can make new things that are relatable and comprehensible but, at the same time, completely unexpected.

So unexpected are these new AI-generated images, in fact, that—in the silent awe immediately following the *wow*—another thought occurs to just about everyone who has encountered them: Human-made art must now be over. Who can compete with the speed, cheapness, scale, and, yes, wild creativity of these machines? Is art yet another human pursuit we must yield to robots? And the next obvious question: If computers can be creative, what else can they do that we were told they could not?

I have spent the past six months using AIs to create thousands of striking images, often losing a night's sleep in the unending quest to find *just one more* beauty hidden in the code. And after interviewing the creators, power users, and other early adopters of these generators, I can make a very clear prediction: Generative AI will alter how we design just about everything. Oh, and not a single human artist will lose their job because of this new technology.



IT IS NO EXAGGERATION TO CALL images generated with AI *cocreations*. The sobering secret of this new power is that the best applications of it are the result not of typing in a single prompt but of very long

conversations between humans and machines. Progress for each image comes from many, many iterations, back-and-forths, detours, and hours, sometimes days, of teamwork—all on the back of years of advancements in machine learning.

AI image generators were born from the marriage of two separate technologies. One was a historical line of deep-learning neural nets that could generate coherent realistic images, and the other was a natural language model that could serve as an interface to the image engine. The two were combined into a language-driven image generator. Researchers scraped the internet for all images that had adjacent text, such as captions, and used billions of these examples to connect visual forms to words, and words to forms. With this new combination, human users could enter a string of words—the prompt—that described the image they sought, and the prompt would generate an image based on those words.

Scientists now at Google invented the diffusion computational models that are at the core of image generators today, but the company has been so concerned about what people might do with them that it still has not opened its own experimental generators, Imagen and Parti, to the public. (Only employees can try them, and with tight guidelines on what can be requested.) It is no coincidence, then, that the three most popular platforms for image generators right now are three startups with no legacy to protect. Midjourney is a bootstrapping startup launched by David Holz, who based the generator in an emerging community of artists. The interface to the AI is a noisy Discord server; all the work and prompts were

made public from the start. DALL-E is a second-gen product of the nonprofit OpenAI, funded by Elon Musk and others. Stable Diffusion appeared on the scene in August 2022, created by Emad Mostaque, a European entrepreneur. It's an open source project, with the added benefit that anyone can download its software and run it locally on their own desktop. More than the others, Stable Diffusion has unleashed AI image generators into the wild.

Why are so many people so excited to play with these AIs? Many images are being created for the same reason that humans have always made most art: because the images are pretty and we want to look at them. Like flames in a campfire, the light patterns are mesmerizing. They never repeat themselves; they surprise, again and again. They depict scenes no one has witnessed before or can even imagine, and they are expertly composed. It's a pleasure similar to exploring a video game world, or paging through an art book. There is a real beauty to their creativity, and we stare much in the way we might appreciate a great art show at a museum. In fact, viewing a parade of generated images is very much like visiting a personal museum—but in this case, the walls are full of art we ask for. And the perpetual novelty and surprise of the next image hardly wanes. Users may share the gems they discover, but my guess is that 99 percent of the 20 million images currently generated each day will only ever be viewed by a single human—their cocreator.

Like any art, the images can also be healing. People spend time making strange AI pictures for the same reason they might paint on Sundays, or scribble in a journal, or shoot a video. They use the media to work out something in their own lives, something that can't be said otherwise. I've seen images depicting what animal heaven might look like, created in response to the death of a beloved dog. Many images explore the representation of intangible, spiritual realms, presumably as a way to think about them. "A huge portion of the entire usage is basically art therapy," Holz, the Midjourney creator, tells me. "The images are not really aesthetically appealing in a universal sense but are appealing, in a very deep way, within the context of what's going on in people's lives." The machines can be used to generate fantasies of all types. While the hosted services prohibit porn and gore, anything goes on the desktop versions, as it might in Photoshop.

AI-generated pictures can be utilitarian too. Say you are presenting a report on the possibility of recycling hospital plastic waste into construction materials and you want an image of a house made out of test tubes. You could search stock photo markets for a usable image made by a human artist. But a unique assignment like this rarely yields a preexisting picture, and even if found, its copyright status could be dubious or expensive. It is cheaper, faster, and probably far more appropriate to generate a unique, personalized image for your report in a few minutes that you can then insert into your slides, newsletter, or blog—and the copyright ownership is yours (for now). I have been using these generators myself to cocreate images for my own slide presentations.

In an informal poll of power users, I found that only about 40 percent of their time is spent seeking utilitarian images. Most AI images are used in places where there were no images previously. They usually do not replace an image created by a human artist. They may be created, for example, to illustrate a

text-only newsletter by someone without artistic talent themselves, or the time and budget to hire someone. Just as mechanical photography did not kill human illustrations a century ago, but rather significantly expanded the places in which images appeared, so too do AI image generators open up possibilities for more art, not less. We'll begin to see contextually generated images predominately in spaces that are currently blank, like emails, text messages, blogs, books, and social media.

This new art resides somewhere between painting and photography. It lives in a possibility space as large as painting and drawing—as huge as human imagination. But you move through the space like a photographer, hunting for discoveries. Tweaking your prompts, you may arrive at a spot no one has visited before, so you explore this area slowly, taking snapshots as you step through. The territory might be a subject, a mood, or a style, and it might be worth returning to. The art is in the craft of finding a new area and setting yourself up there, exercising good taste and the keen eye of curation in what you capture. When photography first appeared, it seemed as if all the photographer had to do was push the button. Likewise, it seems that all a person has to do for a glorious AI image is push the button. In both cases, you get an image. But to get a great one—a truly artistic one—well, that's another matter.



ACCESSIBLE AI IMAGE GENERATORS are not even a year old, but already it is evident that some people are much better at creating AI images than others. Although they're using the same programs, those who

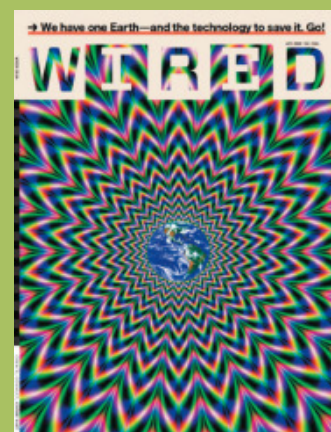
have accumulated thousands of hours with the algorithms can magically produce images that are many times better than the average person's. The images by these masters have a striking coherence and visual boldness that is normally overwhelmed by the flood of details the AIs tend to produce. That is because this is a team sport: The human artist and the machine artist are a duet. And it requires not just experience but also lots of hours and work to produce something useful. It is as if there is a slider bar on the AI: At one end is Maximum Surprise, and at the other end Maximum Obedience. It is very easy to get the AI to surprise you. (And that is often all we ask of it.) But it is very difficult to get the AI to obey you. As Mario Klingemann, who makes his living selling NFTs of his AI-generated artwork, says, "If you have a very specific image in mind, it always feels like you are up against a force field." Commands like "shade this area," "enhance this part," and "tone it down" are obeyed reluctantly. The AIs have to be persuaded.

Current versions of DALL-E, Stable Diffusion, and Midjourney limit prompts to about the length of a long tweet. Any longer and the words muddle together; the image turns to mush. That means that behind every fabulous image lies a short magic spell that summons it. It begins with the first incantation. How you say it matters. Your immediate results materialize in a grid of four to nine images. From that batch of pictures, you variate and mutate offspring images. Now you have a brood. If they look promising, begin to tweak the spell to nudge it in new directions as it births more generations of

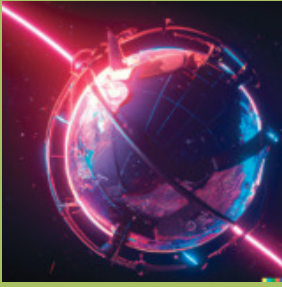


TAKE TWO

AI image generators don't just spit out random acts of art. They must be "prompted"—carefully guided by their human users. So we asked eight of our favorite artists to re-create their original WIRED covers using these new tools. "For the prompts, I started by mixing nonsense words and techniques," says Alvaro Dominguez, who designed our 2020 Climate Issue cover (below). "For example: 'a 3D render of an oil painting.' What is that? I don't know. But I'm trying to bring life to something generated by a machine." Judge the results for yourself—here and on the following pages.



Alvaro Dominguez, ILLUSTRATOR
28.04: We have one Earth...



← “A 3D render of a robotic metallic earth with wires in synthwave style.”

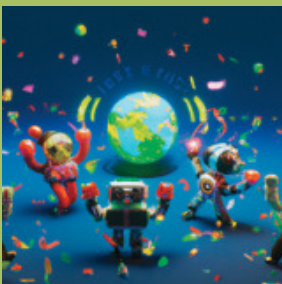


← “A 3D render of earth as a machine with a control panel and many buttons, rainbows, technology, sparkles and flowers”

→ “An oil painting of pixelated planet Earth and robots flying around with a lot of rainbows in Jonas Wood style”

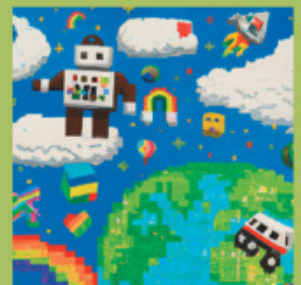


→ “A 3D render of planet Earth with the face of a smily robot inside being part of mother board with monster truck wheels in the style of Jonas Wood”



← “A 3D render of the planet Earth dancing in a robot party, in the style of Jonas Wood, digital art”

→ “An oil painting of pixelated planet Earth and robots flying around with a lot of rainbows in Jonas Wood style”



← “A 3D render of an oil painting of Earth in space surrounded by flowers and technology computer motherboard in Robert Irwin style”

images. Multiply the group again and again as you search for the most compelling composition. Do not despair if it takes dozens of generations. Think like the AI; what does it like to hear? Whisper instructions that have worked in the past, and add them to the prompt. Repeat. Change the word order to see whether it likes that. Remember to be specific. Replicate until you have amassed a whole tribe of images that seem to have good bones and potential. Now cull out all but a select few. Be merciless. Begin outpacing the most promising images. That means asking the AI to extend the image out in certain directions beyond the current borders. Erase those portions that are not working. Suggest replacements to be done by the AI with more incantations (called inpainting). If the AI is not comprehending your hints, try spells used by others. When the AI has gone as far as it can, migrate the image to Photoshop for final tailoring. Present it as if you have done nothing, even though it is not uncommon for a distinctive image to require 50 steps.

Behind this new magecraft is the art of prompting. Each artist or designer develops a way of persuading an AI to yield its best by evolving their prompts. Let's call these new artists AI whisperers, or prompt artists, or promptors. The promptors work almost as directors, guiding the work of their alien collaborators toward a unified vision. The convoluted process required to tease a first-rate picture out of an AI is quickly emerging as a fine-art skill. Almost daily, new tools arrive to make prompting easier, better. PromptBase is a market for promptors to sell prompts that create simple images such as emoticons, logos, icons, avatars, and game weapons. It's like clip art, but instead of selling the art, they sell the prompt that generates the art. And unlike fixed clip art, it is easy to alter and tweak the art to fit your needs, and you can extract multiple versions again and again. Most of these prompts sell for a couple bucks, which is a fair price, given how much trouble it is to hone a prompt on your own.

Above-average prompts not only include the subject but also describe the lighting, the point of view, the emotion evoked, the color palette, the degree of abstraction, and perhaps a reference picture to imitate. As with other artistic skills, there are now courses and guidebooks to train the budding promptor in the finer points of prompting. One fan of DALL-E 2, Guy

Parsons, put together a free Prompt Book, jammed with tips on how to go beyond the wow and get images you can actually use. One example: If your prompt includes specific terms such as "Sigma 75 mm camera lens," Parson says, then the AI doesn't just create that specific look made by the lens; "it more broadly alludes to 'the kind of photo where the lens appears in the description,'" which tends to be more professional and therefore yields higher-quality images. It's this kind of multi-level mastery that produces spectacular results.

For technical reasons, even if you repeat the exact same prompt, you are unlikely to get the same image. There is a randomly generated seed for each image, without which it is statistically impossible to replicate. Additionally, the same prompt given to different AI engines produces different images—Midjourney's are more painterly, while DALL-E is optimized for photographic realism. Still, not every promptor wishes to share their secrets. The natural reaction upon seeing a particularly brilliant image is to ask, "What spell did you use?" What was the prompt? Robyn Miller, cocreator of the legendary game *Myst* and a pioneering digital artist, has been posting an AI-generated image every day. "When people ask me what prompt I used," he says, "I have been surprised that I don't want to tell them. There is an art to this, and that has also surprised me." Klingemann is famous for not sharing his prompts. "I believe all images already exist," he says. "You don't make them, you find them. If you get somewhere by clever prompting, I do not see why I want to invite everybody else there."

It seems obvious to me that promptors are making true art. What is a consummate movie director—like Hitchcock, like Kurosawa—but a promptor of actors, actions, scenes, ideas? Good image-generator promptors are engaged in a similar craft, and it is no stretch for them to try and sell their creations in art galleries or enter them into art contests. This summer, Jason Allen won first place in the digital art category at the Colorado State Fair Fine Art competition for a large, space-opera-themed canvas that was signed "Jason Allen via Midjourney." It's a pretty cool picture that would've taken some effort to make no matter what tools were used. Usually images in the digital art category are created using Photoshop and Blender-type tools that enable the artist to dip into libraries of digitized

Dan Winters, PHOTOGRAPHER

21.10: Crazy Good!

"Using AI was entertaining and somewhat inspirational. It's funny—this is actually a better cover than the one that ran."

PROMPT: "Pixelated taco centered on robins egg blue solid color"



Ian Allen, PHOTOGRAPHER

22.01: Heads Up

"It's currently not amazing. But it's also not terrible."

PROMPT: "A graphic close photographic portrait of a man wearing google glasses and various HUDs"



objects, textures, and parts, which are then collaged together to form the scene. They are not drawn; these digital images are unapologetically technological assemblages. Collages are a venerable art form, and using AI to breed a collage is a natural evolution. If a 3D-rendered collage is art, then a Midjourney picture is art. As Allen told Vice, “I have been exploring a special prompt. I have created hundreds of images using it, and after many weeks of fine-tuning and curating my gens, I chose my top three and had them printed on canvas.”

Of course, Allen’s blue ribbon set off alarm bells. To some critics, this was a sign of the end times, the end of art, the end of human artists. Predictable lamentations ensued, with many pointing out how unfair it felt for struggling artists. The AIs are not only going to take over and kill us all—they are, apparently, going to make the world’s best art while doing so.



AT ITS BIRTH, EVERY NEW TECHNOLOGY ignites a Tech Panic Cycle. There are seven phases:

1. Don’t bother me with this nonsense. It will never work.
2. OK, it is happening, but it’s dangerous, ‘cause it doesn’t work well.
3. Wait, it works too well. We need to hobble it. Do something!
4. This stuff is so powerful that it’s not fair to those without access to it.
5. Now it’s everywhere, and there is no way to escape it. Not fair.
6. I am going to give it up. For a month.
7. Let’s focus on the real problem—which is the next current thing.

Today, in the case of AI image generators, an emerging band of very tech-savvy artists and photographers are working out of a Level 3 panic. In a reactive, third-person, hypothetical way, they fear other people (but never themselves) might lose their jobs. Getty Images, the premier agency selling stock photos and illustrations for design and editorial use, has already banned AI-generated images; certain artists who post their

work on DeviantArt have demanded a similar ban. There are well-intentioned demands to identify AI art with a label and to segregate it from “real” art.

Beyond that, some artists want assurances that their own work not be used to train the AIs. But this is typical of Level 3 panic—in that it is, at best, misguided. The algorithms are exposed to 6 billion images with attendant text. If you are not an influential artist, removing your work makes zero difference. A generated picture will look exactly the same with or without your work in the training set. But even if you are an influential artist, removing your images still won’t matter. Because your style has affected the work of others—the definition of influence—your influence will remain even if your images are removed. Imagine if we removed all of Van Gogh’s pictures from the training set. The style of Van Gogh would still be embedded in the vast ocean of images created by those who have imitated or been influenced by him.

Styles are summoned via prompts, as in: “in the style of Van Gogh.” Some unhappy artists would rather their names not be permitted as prompts. So even if their influence can’t be removed, you can’t reach it because their name is off-limits. As we know from all previous attempts at censoring, these kinds of speech bans are easy to work around; you can misspell a name, or simply describe the style in words. I found, for example, that I could generate detailed black-and-white natural landscape photographs with majestic lighting and prominent foregrounds—without ever using Ansel Adams’ name.

There is another motivation for an artist to remove themselves. They might fear that a big corporation will make money off their work, and their contribution won’t be compensated. But we don’t compensate human artists for their influence on other human artists. Take David Hockney, one of the highest-paid living artists. Hockney often acknowledges the great influence other living artists have on his work. As a society, we don’t expect him (or others) to write checks to his influences, even though he could. It’s a stretch to think AIs should pay their influencers. The “tax” that successful artists pay for their success is their unpaid influence on the success of others.

What’s more, lines of influence are famously blurred, ephemeral, and imprecise. We are all influenced by every-

Margaret Swart, DESIGNER & FORMER WIRED ART DIRECTOR

26.12: Less Artificial, More Intelligent

“I tried illustrations because I thought I might get something interesting. No such luck.”

PROMPT: “Type illustrations ‘Less’ ‘Artificial’ ‘More’ ‘Intelligent’”

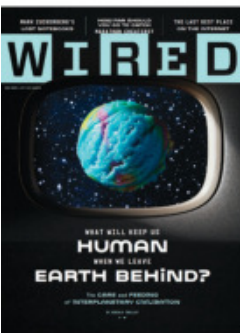


Stephanie Gonot, PHOTOGRAPHER

28.02: What Will Keep Us Human ... ?

“I’m hooked!”

PROMPT: “Mysterious photo of food floating in outerspace through a spaceship window”



Art Is Human
by ADAM GARCIA





thing around us, to degrees we are not aware of and certainly can't quantify. When we write a memo or snap a picture with our phone, to what extent have we been influenced—directly or indirectly—by Ernest Hemingway or Dorothea Lange? It's impossible to unravel our influences when we create something. It is likewise impossible to unravel the strands of influence in the AI image universe. We could theoretically construct a system to pay money earned by the AI to artists in the training set, but we'd have to recognize that this credit would be made arbitrarily (unfairly) and that the actual compensatory amounts per artist in a pool of 6 billion shares would be so trivial as to be nonsensical.

In the coming years, the computational engine inside an AI image generator will continue to expand and improve until it becomes a central node in whatever we do visually. It will have literally seen everything and know all styles, and it will paint, imagine, and generate just about anything we need. It will become a visual search engine and a visual encyclopedia with which to understand images, and the primary tool we use with our most important sense, our sight. Right now, every neural net algorithm running deep in the AIs relies on massive amounts of data—thus the billions of images needed to train it. But in the next decade, we'll have operational AI that relies on far fewer examples to learn, perhaps as few as 10,000. We'll teach even more powerful AI image generators how to paint by showing them thousands of carefully curated, highly selected images of existing art, and when this point comes, artists of all backgrounds will be fighting one another to be included in the training set. If an artist is in the main pool, their influence will be shared and felt by all, while those not included must overcome the primary obstacle for any artist: not piracy, but obscurity.



AS SOON AS 2D GENERATIVE ALGORITHMS were born, experimenters rushed to figure out what was next. Jensen Huang, the ambitious cofounder of Nvidia, believes

the next generation of chips will generate 3D worlds for the metaverse—"the next computing platform," as he calls it. In a single week this past September, three novel text-to-3D/video image generators were announced: GET3D (Nvidia), Make-a-Video (Meta), and DreamFusion (Google). The expansion is happening faster than I can write. Amazing as frameable 2D pictures produced by AI are, outsourcing their creation is not going to radically change the world. We are already at peak 2D. The genuine superpower being released by AI image generators will be in producing 3D images and video.

A future prompt for a 3D engine might look something like this: "Create the messy bedroom of a teenager, with posters on the wall, an unmade bed, and afternoon sunlight streaming through closed blinds." And in seconds, a fully realized room is born, the closet door open and all the dirty clothes on the floor—in full 3D. Then, tell the AI: "Make a 1970s kitchen with refrigerator magnets and all the cereal boxes in the pantry. In full volumetric detail. One that you could walk through. Or that could be photographed in a video." Games crammed with alternatively rendered worlds and full-length movies decked out with costumes and sets have eternally been out

THERE'S A HILARIOUS illustration from Paris in late 1839, mere months after an early type of photograph called a daguerreotype was announced to the world, that warned what this innovation portended. In Théodore Maurisset's imagination, the daguerreotype would bring about a collective hysteria, in which crazed masses arrive from the ends of the earth and overrun a small photo studio. The clamor is so feverish it brings about a mass hallucination, in which nearly everything else in the landscape, including railroad cars, a clock tower, a basket for a hot-air balloon—anything remotely boxy in shape—morphs into cameras. As they march to the studio, the crowds pass by half a dozen gallows where, in response to the daguerreotype's appearance, artists have hung themselves. The people hardly notice.

What a ruckus! What panic! And why not? Until the appearance of photography, painters had nearly a monopoly on artistic representation. But now those silly photographers, most of whom were rank amateurs or, worse, disloyal or failed artists, would get the job. Upon seeing a daguerreotype for the first time around 1840, the French painter Paul Delaroche, whose own students would soon defect to photography, was said to have cried out, "From today, painting is dead!"

The history of painting's early relationship with photography is not perfectly analogous to the conundrum caused by today's AI art, made by image generators like DALL-E 2, Midjourney, and Stable Diffusion. But compare Delaroche's exclamation to the crowing of Jason Allen of Pueblo West, Colorado, who took home first prize for his AI-generated entry in an art competition at the state fair last September. The \$300 prize was modest, but that didn't stop Allen from gloating. "Art is dead, dude," he said afterward. "It's over. AI won. Humans lost."

In the 19th century, painting, at least, did not die. Or even suffer a mild cold. Painters did not lose jobs, and Delaroche himself went on to paint some of his most monumental and ambitious work.

Still, Maurisset's vision of the masses ram-paging the landscape was not totally wrong. The people who wanted to sit before the camera or sought cameras for themselves were not only countless but diverse. They were a different group of patrons than those supporting painters, tending to be from the middle and working classes, whose previous ability to buy or make images was almost nil. During an age that included reforms to expand the vote, early activism for women's rights, and the abolition of slavery, the camera acquired a democratic air. Frederick Douglass, the abolitionist and former slave, had over 160 portraits taken—more than any other American in the 19th century—in the belief that through them he could insist on his self-worth and dignity. The camera was potentially everybody's tool (it wasn't exactly, but that was the promise), and such a thing had rarely been said about painting.

In those early days, the two media tended to have different markets. Even the most skilled and art-minded photographers were always fighting the lowly status accorded their craft by the art establishment. Whereas painting as a studio practice became a standard college offering as early as the 1860s (at least in New England), it took photography another 75 years to find a tenuous footing in higher education.

The earliest cameras tended to be large contraptions, requiring a sturdy tripod and

finagling with chemicals. They had very slow shutters and needed lots of light, and a darkroom within shouting distance. They therefore tended to be best suited for subjects that were rooted in place: trinkets and knickknacks around the house, buildings, still lifes, landscapes—anything that didn't disturb focus or exposure. It was perhaps predictable, if gruesome, that when early photographers went to the war front, they sought not the action of battle but the corpses that remained afterward. The pictures that resulted, ironically, promoted even more those stilled or frozen subjects among painters, and they eventually helped reverse the hierarchy of painterly ambition, from the pursuit of complicated narrative paintings to scenes and objects of everyday life.

Cameras also brought a new awareness to *how* we see. Especially after manufacturers introduced the humble handheld camera, painters discovered modes of looking previously considered unworthy of the canvas: the casual glance, the momentary glimpse, the uncomfortable stare; or, in a bawdier vein, the paparazzi glare, the voyeuristic peek, the secret spying. With cameras there is always the risk of the blur, the out-of-focus, the unintended, and the serendipitous; and it is one of the orthodoxies in the history of art that modernist modes of expression explored all of them. Indeed, it's hard to look at some masterpieces from the late 19th century—say, all those sun-drenched, blurry haystacks by Monet, or the leafy, happy café scenes of Renoir, or those weirdly placed, yawning, stretching, off-kilter ballerinas by Degas—and not recognize the impact of photographs.

The influence went the other way too. To photographers who fancied themselves artists (not “operators,” as they called those whom they viewed as commercial hacks), the darkroom was like a painter's studio, the touching and retouching of the negative like a studio practice. Julia Margaret Cameron, the Victorian photographer who re-created scenes from English literature, frequently made a mess of the large glass plate negatives. She got her fingerprints all over the emulsion, smudged the surface, over- and underexposed the print, and awkwardly highlighted the out-of-focus and accidental portions of the image. To a commercial photographer, those blips and blobs were imperfections to avoid. To Cameron, they were aspects to cultivate because they resembled the idiosyncratic choices and handcrafted manipulations of the genius-painter.

Those photographers who actually cared about opinion and profit, too, regularly refined their work to concoct acceptable prints for their patrons. In all of these manipulations, they relied on an aesthetic sensibility cultivated by painters. A portrait or a landscape looked right when it looked like a painter's version. The very first photographic team in Scotland incorporated this understanding into their process: Robert Adamson, an engineer and millwright by training, took the photographs and handed

THE PAST IS PHOTOG

WHEN THE
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by
ANTHONY W.
LEE



the negatives over to his partner, David Octavius Hill, a painter by profession, to gussy them up. For portraiture, the trade journals referred to “the Rembrandt style,” to signal the example the photographer ought to follow. And in a phrase that revealed the associations some photographers wanted to cultivate, the journals regularly referred to them as “sun painters.”

For all that, photography was still regarded by most contemporaries as a technology that bypassed human touch. The sun, camera, lens, shutter, and silvered surface seemed to do all the work; the operator appeared merely to get the process going. Sure, it required knowledge of chemicals, glass, and optics (and a tolerance for noxious fumes), but those were thought peripheral to artistry—peripheral to the painter’s concerns with oils and brushes and the translation of feeling and thought into painted surfaces. It’s not identical to accusations of lack of imagination that some artists make of AI-generated pictures today. But the point is taken: The new tool is ersatz.

From the perspective of 1839, perhaps the most unlikely development in the fine-art scene was the opportunity for collaboration. To early observers, the camera’s black-and-white image was a sign of its novelty, but the craze was quickly augmented by the demand for color. Photographers started hiring painters, who added all sorts of details to photographs, frequently with oil paint but also with watercolors, crayons, and chalk. The practice, begun in Europe and later especially popular and refined in Japan, took on a more flamboyant quality in the US. A sitter wanted rosier cheeks? You got it! Maybe some blue eyes? Let’s try different shades! Or how about a sitter who wanted something she couldn’t bring to the studio (or couldn’t afford), like a diamond ring? Look how big we can make it! The additions could be piecemeal—a bit of rouge here, a dab of gold there—or more sweeping, with the brushwork covering most of the image and producing a weird hybrid picture. Over time, the collaborations could become more structured. In the treaty ports of China, for example, some entrepreneurs set up businesses with separate photography and painting departments and offered both media to clients.

Pace the pronouncements of Delaroche and Maurisette—and, in our time, Jason Allen—it’s always too soon to sound the death knell of painting or painters. Painting as a fine art will persist; much of the high-end gallery scene promotes and relies on it. And for many, the tactility of putting brush on canvas is an intimate and joyous form of expression that simply cannot be replaced. But if painting’s dance with photography in the 19th century is any indication, there may well be a period of mutual influence, give and take, and perhaps collaboration between some artists and the machine. As Degas once told a painter friend who wanted nothing to do with newfangled amusements, “You need the natural life. I, the artificial.”

ANTHONY W. LEE is a professor of art history at Mount Holyoke College in Massachusetts.

Jessica Pettway, PHOTOGRAPHER

28.09: The Evolution of Digital Blackface

“It wasn’t necessary to add ‘white’ to phrases. That was assumed.”

PROMPTS: built with words like “hoop earring,” “mouth smiling wearing grills,” “white hand with super long nails pointing”



of reach for individual artists, who remain under the power of large dollars. AI could make games, metaverses, and movies as quick to produce as novels, paintings, and songs. Pixar films in an instant! Once millions of amateurs are churning out billions of movies and endless metaverses at home, they will hatch entirely new media genres—virtual tourism, spatial memes—with their own native geniuses. And when big dollars and professionals are equipped with these new tools, we’ll see masterpieces at a level of complexity never seen before.

But even the vast universes of 3D worlds and video are not vast enough to contain the disruption that AI image generators have initiated. DALL-E, Midjourney, and Stable Diffusion are just the first versions of generative machines of all types. Their prime function, pattern recognition, is almost a reflex for human brains, something we accomplish without conscious thinking. It is at the core of almost everything we do. Our thinking is more complex than just pattern recognition, of course; dozens of cognitive functions animate our brain. But this single type of cognition, synthesized in machines (and the only cognition we have synthesized so far), has taken us further than we first thought—and will probably continue to advance further than we now think.

When an AI notices a pattern, it stores it in a compressed way. Round objects are placed in a “roundness” direction, red objects in another direction for “redness,” and so on. Maybe it notices “treeness” and “foodness” too. It abstracts out billions of directions, or patterns. Upon reflection—or training—it notices that the overlap of these four qualities produces “appleness,” yet another direction. Furthermore, it links all these noticed directions with word patterns, which can also share overlapping qualities. So when a human requests a picture of an apple via the word “apple,” the AI paints an image with those four (or more) qualities. It is not assembling bits of existing pictures; rather, it is “imagining” a new picture with the appropriate qualities. It sort of remembers a picture that does not exist but could.

This same technique can be used—in fact, is already being used, in very early forms—to find new drugs. The AI is trained

Sam Cannon, PHOTOGRAPHER

29.10: Withdrawal

"It wasn't able to render out a close replica of my cover—for now."

PROMPT: "A 3D rendering of a figure with its head in its hands being pierced with thousands of needles, octane, harsh light"



Patrick Savile, ILLUSTRATOR

30.06: A New Internet

"The image in my head turned out to be egg-based."

PROMPT: "Airbrush art, cracked egg, Japanese 70s design, surrealism, yves tanguy, koichi sato, magritte bunch of robots"



on a database of all the molecules we know to be active medicines, noticing patterns in their chemical structures. Then the AI is asked to “remember” or imagine molecules we have never thought of that seem to be similar to the molecules that work. Wonderfully, some of them actually do work, just as an AI image of a requested imaginary fruit can look remarkably like a fruit. This is the real transformation, and soon enough, the same technique will be used to help design automobiles, draft laws, write code, compose soundtracks, assemble worlds to entertain and instruct, and cocreate the stuff we do as work. We should take to heart the lessons we’ve learned so far from AI image generators, because there will soon be more pattern-seeking AIs in all realms of life. The panic cycle we presently face is simply a good rehearsal for the coming shift.

What we know about AI generators so far is that they work best as partners. The nightmare of a rogue AI taking over is just not happening. That vision is fundamentally a misreading of history. In the past, technology has rarely directly displaced humans from work they wanted to do. For instance, the automatic generation of pictures by a machine—called a camera—was feared in the 1800s because it would surely put portrait painters out of business. But the historian Hans Rooseboom could find only a *single* portrait painter from that time who felt unemployed by photography. (Photography actually inspired a resurgence of painting later in that century.) Closer to our time, we might have expected professional occupations in photography to fall as the smartphone swallowed the world and everybody became a photographer—with 95 million uploads to Instagram a day and counting. Yet the number of photography professionals in the US has been slowly rising, from 160,000 in 2002 (before camera phones) to 230,000 in 2021.

Instead of fearing AI, we are better served thinking about what it teaches us. And the most important thing AI image generators teach us is this: Creativity is not some supernatural force. It is something that can be synthesized, amplified, and manipulated. It turns out that we didn’t need to achieve intelligence in order to hatch creativity. Creativity is more elemental than we thought. It is independent of con-

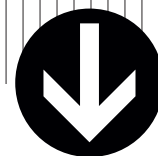
sciousness. We can generate creativity in something as dumb as a deep-learning neural net. Massive data plus pattern-recognition algorithms seems sufficient to engineer a process that will surprise and aid us without ceasing.

Scholars of creativity refer to something called Uppercase Creativity. Uppercase Creativity is the stunning, field-changing, world-altering rearrangement that a major breakthrough brings. Think special relativity, the discovery of DNA, or Picasso’s *Guernica*. Uppercase Creativity goes beyond the merely new. It is special, and it is rare. It touches us humans in a profound way, far beyond what an alien AI can fathom.

To connect with a human deeply will always require a Creative human in the loop. This high creativity, however, should not be confused with the creativity that most human artists, designers, and inventors produce day-to-day. Mundane, ordinary, lowercase creativity is what we get with a great new logo design or a cool book cover, a nifty digital wearable or the latest must-have fashion, or the set design for our favorite sci-fi serial. Most human art, past and present, is lowercase. And lowercase creativity is exactly what the AI generators deliver.

But this is huge. For the first time in history, humans can conjure up everyday acts of creativity on demand, in real time, at scale, for cheap. Synthetic creativity is a commodity now. Ancient philosophers will turn in their graves, but it turns out that to make creativity—to generate something new—all you need is the right code. We can insert it into tiny devices that are presently inert, or we can apply creativity to large statistical models, or embed creativity in drug discovery routines. What else can we use synthetic creativity for? We may feel a little bit like medieval peasants who are being asked, “What would you do if you had the power of 250 horses at your fingertips?” We dunno. It’s an extraordinary gift. What we do know is we now have easy engines of creativity, which we can aim into stale corners that have never seen novelty, innovation, or the wow of creative change. Against the background of everything that breaks down, this superpower can help us extend the wow indefinitely. Used properly, we can make a small dent in the universe. 🍳





WIN GIN GIT

AMAZON GOT INTO the air cargo business to guarantee fast delivery. But when a risk-taking tech giant tries to commandeer a risk-averse industry, not everything goes smoothly.

by_
CAITLIN HARRINGTON

photographs by_
SPENCER LOWELL



CHRISTMAS WAS RAPIDLY APPROACH-ing, and Amazon was facing a crisis. In the waning shopping days of 2014, the retailer was preparing to promote its deal of the day: the Amazon Kindle, delivered just in time for Christmas. Then it discovered a problem. Stock was running low within driving distance of Seattle, where the company is head-quartered. Amazon turned to UPS to airlift more e-readers to the city, but with the holiday season in full swing, the parcel service was unwilling to divert more planes to appease its increasingly demanding client. Amazon, it appeared, would not be able to deliver its signature device to shoppers in its own backyard.

The prospect of failure was unbearable to executives steeped in founder Jeff Bezos' doctrine of customer obsession, according to a former employee. They were also still haunted by the nightmare of the previous Christmas, when many packages landed late on the doorsteps of aggrieved buyers. But the 2013 fiasco had largely been due to ground transportation issues. This latest crisis was an air problem. While Amazon had spent the previous year building up its network of sortation centers to streamline truck delivery, the company depended entirely on FedEx and UPS to fly most of its packages around the United States. If those carriers couldn't keep up with demand, Amazon wouldn't be able to honor its Prime "promise" to ship any imaginable commodity to tens of millions of households within two days.

Worried about a second straight holiday season meltdown, Dave Clark, then Amazon's head of worldwide operations, ordered his transportation team to rustle up some airplanes, fast, according to a former employee. Scott Ruffin, a former marine logistics officer who handled procurement for the sortation centers, reached out to everyone he knew in the

industry and eventually helped charter enough planes to fly Kindles to Seattle from far-flung fulfillment centers. Christmas was saved. But what about next year, and the year after that? Amazon decided it needed more control over its destiny. It needed its own air network.

Amazon is famous—or infamous—for its breakneck pace of innovation and data-driven efforts to squeeze every drop of productivity out of workers. Its drivers are reported to operate on punishing schedules, its warehouse workers are timed to the second, and the US Occupational Safety and Health Administration has launched multiple probes into conditions at its warehouses. At the same time, its corporate values are hallowed within the company walls. “Jeff Bezos came down from the mountain with 12 leadership principles,” jokes a former staffer. They urge a “bias for action,” declaring that “speed matters” and “many decisions and actions are reversible and do not need extensive study.”

The aviation world moves more slowly. Airport space is difficult to come by; cargo jets are enormously expensive to convert and operate. (“You know how you become a millionaire in the air business?” quips one aviation veteran. “You start with a billion dollars.”) Running an air cargo service requires compliance with government regulations covering security, labor relations, and most important of all, safety, to prevent accidents and loss of life.

But Amazon has managed to build its own sizable cargo service in just a few years, dramatically reducing its reliance on UPS and FedEx. (FedEx eventually terminated its Amazon contracts in 2019.) The company now owns 11 planes and leases about 100 others, flown by seven air carriers that make more than 200 flights a day out of 71 airports, including a European hub near Leipzig, Ger-

many. This fleet, known as Amazon Air, flies orders from fulfillment centers to customers when items are stored too far away to transport by truck, the company says. Last year, Amazon opened a \$1.5 billion air hub at Cincinnati/Northern Kentucky International Airport—among the largest capital investments in the company’s history. As a result, nearly three-quarters of Americans in the continental US live within 100 miles of an Amazon airport, according to a September report by DePaul University.

The story of Amazon Air demonstrates the lengths the company will go to keep its promise to customers and maintain its retail dominance. It’s a side of the company that most shoppers rarely see, unless they happen to glance up in the sky. But as the program continues to expand, some former employees say these costly, emission-spewing airplanes are often underfilled or are used to ship goods that could be carried more cheaply and efficiently by road.

WIRED spoke to more than two dozen current and former Amazon Air employees about how the company launched an air service with the agility of a startup and the muscle of a megacorporation. Most spoke anonymously, for fear of retaliation or jeopardizing their careers. They described an entrepreneurial culture that accomplished big things fast, but also toxic management, angry communities, pilots pushed past their limits, and a singular focus on rapid growth, even at the expense of efficiency. One former employee says some colleagues used to joke, “We took off, and there was no landing gear.”



JUST OVER A YEAR AFTER THE

Christmas Kindle crisis, Jeff Bezos assembled some of his S-team—a trusted cadre of senior executives—and members of the Middle Mile organization, which handled in-house transportation between Amazon’s warehouses, to make some important decisions. According to a former employee with knowledge of the event, the meeting began in typical Amazon fashion with attendees sitting around a table silently reading. In this case, they studied a six-page white paper drawn up by the Middle Mile team, which laid out potential operating models for an air network. Among the first big choices: Should Amazon acquire and operate its own airline or construct “an organization to interact with an airline,” as one former employee put it, outsourcing the flying, regulatory compliance, and liabilities? The former option would give the company greater control over the program but would also take much longer to execute and be riskier and more complex. For one thing, it would force Amazon to deal directly with the US Federal Aviation Administration (FAA).

When everyone finished reading, they took turns posing questions. The sentiment seemed to be leaning toward acquisition—until Bezos spoke, last, as he typically did in these meetings, so as not to inhibit discussion. “Planes are planes,” an employee recalls him saying. “What are we going to do to differentiate?” This was a Bezos maxim. He preferred to spend Amazon’s prodigious resources on initiatives where the company would not only be profitable but disruptive. Nobody had a good answer.

Ultimately, Bezos decided to contract out the flying. That meant Amazon would enlist carriers certified by the FAA to pilot planes it leased, or even owned, to bring packages closer to cus-



tomers. One upshot, multiple former employees say, was that Amazon could avoid directly employing pilots, the vast majority of whom are unionized. It would also have multiple airlines competing for its business. “If one of the pilot unions messes around,” says a former Amazon Air employee and aviation industry longtimer, “they can just give the business to the other ones.”

A couple of departments at Amazon ran pilot programs, code-named Archangel and Amelia, with a handful of airports to test out different air transport models. Leaders from the Middle Mile team had studied the German shipping giant DHL, which outsourced its US flight operations to multiple small

cargo airlines that provide clients with aircraft, crew, maintenance, and insurance—ACMI, in industry parlance—and they asked the airlines to replicate that model for Amazon.

The experiments worked, and in 2016 Amazon signed long-term deals to lease 40 jets from two ACMI carriers: Air Transport Services Group (ATSG) and Atlas Air. The group from Middle Mile was officially tasked with running Amazon Air. Soon after, planes emblazoned with Amazon’s signature arrow on the tail and the words “Prime Air” on the body started flying across the US.

In the early days, most of the people on the Amazon Air team had little experience in air cargo, according to

↑ By 2021, Amazon Air was overseeing more than 200 flights a day.

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some employees. “People can learn the aviation part,” says a former staffer. “What was more important was having people that [embrace] the Amazon leadership principles,” like mandates to innovate, invent, and “think differently.” To some aviation industry veterans, this approach seemed naive, even arrogant. But there were Amazon employees who viewed the aviation veterans as frustratingly cautious. “People from FedEx and Boeing struggle coming to Amazon, because they will take months and analyze things to death before they make decisions,” says a former Amazon Air leader, adding, “Amazon has a DNA of decisionmaking and risk-taking.”

With airport space scarce, the team

constructed package processing facilities at airports wherever they could find room, like in out-of-the-way hangars from World War II. In Stockton, California, the company erected a temporary structure jokingly known as the “circus tent.” “We didn’t try to launch it 100 percent perfectly. We launched it like 70 percent perfectly,” says a former employee.

Even as they plowed ahead, some employees labeled air delivery a “defect,” a phrase that became a common refrain on the team. Air transport is much costlier than ground shipping. It’s also about 10 times more carbon-intensive than truck transport, according to researchers at the MIT Center for

Transportation and Logistics. While some staffers said Amazon sold too many products to place each one within a two-day drive, others argued that with better forecasting and inventory placement, you wouldn’t need so many planes, especially as Amazon’s network of fulfillment centers multiplied. UPS, says a former Amazon employee and cargo industry veteran, saved hundreds of millions of dollars by better connecting its ground network rather than buying more aircraft. But Amazon was intent on covering the entire country—and beyond—by air, say three former employees.

Ruffin, now head of Amazon Air, drove a breakneck pace; long hours, weekend availability, and heavy travel schedules were a given. Numerous former employees characterized him as a talented strategist with a long-term vision and a short fuse. Former staff said he was prone to outbursts and reduced at least one staffer to tears. One former employee described him as “a go-go former marine, a real ballbuster.”

Amazon Air operated much like a startup, and employees were encouraged to experiment. A former staffer recalls Bezos’ edict to the team: “Don’t try to make the airplanes fly faster. That’s Boeing’s job. Your job is to design the network, the operations, and technology in a way that is disruptive.” When beholden to FedEx and UPS, Amazon had to operate on a rigid timetable so those carriers could meet their own overnight delivery commitments. Now that Amazon Air transported only its own volume, the company could design more flexible, customized systems built around its two-day delivery window that lasted until 10 pm. “You get presented with a problem like, ‘We need to move this many packages to Seattle in December,’” recalls a former early staffer. “At UPS they’d say, ‘Our building can’t handle that many packages.’ At Amazon, they said, ‘Well, let’s [lease space at an] airport in Portland and truck it up.’”

Amazon’s disruptive mindset didn’t sit well with everyone. The Amazon Air team had wide latitude to change flight schedules based on factors like demand, aircraft and crew availability, the location of cargo, and how full they could get the planes. In the early days, employees adjusted schedules on a monthly

basis—more frequently than was standard in the industry. Meanwhile, some less experienced staffers tinkered with schedules without fully understanding the consequences for aircraft maintenance and other aviation particularities. “Then the carriers would look at it and be like, ‘This doesn’t make any sense,’” says a former employee. “It was their first time truly tasting how Amazon works, how demanding it is, how tiring it can get.”

On a visit to an Amazon Air facility in California in 2016, one former Amazon employee saw pilots resting in the cockpit before their flights. (A pilot representative told Bloomberg around that time that Amazon’s schedules sometimes left them nowhere to rest but the cockpit.) He had heard their complaints about having to spend excess time on the plane, and now he was seeing it firsthand. “They were getting jerked around by Amazon and the ridiculous schedule changes that we were dropping on them,” says the former employee, who adds that schedules would sometimes change at the last minute. “It was not uncommon for us to be like, ‘Oh, hey, we know that you’re supposed to be flying from Cincinnati to Seattle tomorrow. We decided we want you to go to Portland instead,’” says another former air employee.

“Amazon knew the airlines were working with this big juggernaut and wanted to do whatever they could to make us happy—at the sacrifice of pilot morale,” says the same employee. (An Amazon spokesperson says the company provides its desired flight schedule to carriers but does not have a say in pilot scheduling. The company also says it now automates its schedules and

updates them three to four times a year.)

The tensions came to a head two days before Thanksgiving. Early that morning, an Amazon employee was brushing his teeth when he glanced down at his phone. “I started to see this flood of emails come in: Flight canceled. Flight canceled. Flight canceled.” A group of pilots for ABX Air, a subsidiary of ATSG, had landed in Dallas around 2 am, deplaned, and instead of continuing on, told the ground crew they were leaving, according to another former employee. Over the course of the day, around 250 ABX pilots walked off the job, protesting the demands ABX was placing on them amid an industry-wide staffing shortage and soaring workload from customers like Amazon and DHL. According to court filings, around half of the pilots had already taken at least six “emergency” assignments by June, the annual limit in their labor contract. (ABX did not respond to requests for comment.)

The standoff ended when a judge ordered the pilots back to work the following day. Nonetheless, Ruffin suspended Amazon’s business with ABX for several more weeks, until the company was sure the pilots wouldn’t strike again, a spokesperson told Recode. “The strike was a power play to have the union say, ‘We are important. Our pilots are important. And we have control,’” says a former Amazon Air employee. “The cessation of operations was Amazon saying, ‘We have a lot more control.’”

Ruffin was pushed out of the company in 2017, although those who spoke to WIRED agreed that his departure was unrelated to the team’s performance. Several former employees heard that his temper had gotten the better of him one too many times. Ruffin did not respond

to requests for comment, and Amazon did not comment on his departure.

He was replaced by Sarah Rhoads, who had previously run fulfillment centers in the UK and Europe. Rhoads lacked a business or air cargo background, but she had served in active duty as a fighter pilot in Iraq—the first woman in the US Navy Strike Fighter Squadron, the Black Aces. She joined Amazon as an operations manager in 2011 and rose quickly through the ranks. “She bled Amazon,” says a former close colleague.

With the major pieces of its operating model in place, Amazon Air turned its focus to scaling up, and fast. The notion of air delivery as a defect seemed to give way to a thirst for expansion. As the number of daily flights climbed, eventually generating millions of potential fleet-flight combinations, the research science team built an automated scheduling system. Managers at airports around the country relayed data to Seattle, where software engineers aimed to make workflows more efficient. “If it takes a minute to offload a box, how do you optimize the process so that it takes 50 seconds?” says a former software engineer. “Even a slight improvement based on the scale of operations was a huge deal.”

And that scale of operations expanded dramatically. Between 2019 and 2021, Amazon Air opened six regional hubs and reached some 200 daily flights in the US. In 2019, the company began taking over ground operations at some airports, staffing them with Amazon ramp agents who loaded, unloaded, and marshaled the planes. The rapid pace of growth continued into the pandemic, when demand for online shopping spiked. A hub in Germany opened in November 2020. In early 2021, the company purchased its first 11 Boeing 767 jets from Delta and WestJet, a fleet its air carriers would operate, capitalizing on steep discounts offered by beleaguered passenger airlines.

The work continued to be demanding, former staffers say, but they swiftly saw the fruits of their labor. “It was not a place where you felt warm and fuzzy,” says one former employee. “But by God, it was a place where you felt intellectually challenged, where you felt intellectually rejuvenated, like you were getting shit done.”

WHAT FEDEX
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MICHAEL GRIFFITH HAD BEEN

flying jets for more than 30 years, piloting US Air Force missions during the first Gulf War. He was a 747 captain for Atlas Air when the airline became one of Amazon's main contractors. Griffith was used to cargo clients wanting basic flight information, like arrival and unloading times. But as a union officer with the Teamsters labor union, he started hearing accounts from fellow pilots and realized they were facing a different kind of customer. Amazon wanted to know what time the wheels touched down, what time they hit the chocks, what time the loader showed up, and when the first and last pallets came off the plane. "They wanted the minutiae," says Griffith, who retired from Atlas last year.

Amazon used the data to tighten its operations, but Griffith says the company would sometimes veer into the pilots' territory. Federal regulations state that an airline's pilot and dispatcher bear responsibility for the safe conduct of a flight, which includes decisions about routing and fuel loads—the amount of fuel a plane carries. But as Amazon began to assert more influence, Griffith and other pilots say the line sometimes blurred.

The Teamsters union that represents Atlas pilots received reports claiming that Amazon requested certain fuel loads from the airlines based on its calculations for the efficiency of a flight. (Amazon pays for fuel.) But fuel loads can be affected by a host of other factors, such as weather and maintenance status. "With all this data that they amassed, they're able to make their own judgments, which may or may not be the safest or even the correct ones," says Griffith.

Amazon spokesperson Olivia Connors writes, "We may share ideas with our carriers from time to time, but it is the sole responsibility of the certificated air carrier and, ultimately, their

assigned pilot in command, to determine the appropriate flight plan and fuel load for each flight. This is reflected in applicable aviation regulations as well as our carrier contracts."

Robert Kirchner, a veteran pilot and Teamsters official who represented the Atlas pilots until late last year, recalls a complaint that crossed his desk in 2020. According to Kirchner, documents reviewed by WIRED, and a person with knowledge of the incident who requested anonymity, Amazon asked Atlas Air to change a route from Kona, Hawaii, to Riverside, California. The economics of cargo flights to Hawaii are tricky, since planes often arrive full to the islands and return nearly empty. The alternative route saved six minutes of flight time and 600 pounds of fuel on a flight that usually carries tens of thousands of pounds; it also required pilots to veer off the established airways.

At over 2,000 miles, the expanse between the mainland and Hawaii is the largest stretch of open ocean commercial pilots traverse. Since they lose access to radar once they reach a certain distance from land, pilots follow established routes and report their positions to air traffic control, which uses this intel to coordinate with other traffic in the sky—and initiate search and rescue operations should something go wrong. Knowing their position on these established tracks can also help pilots confirm that they have enough fuel left to complete the journey. Now, the Teamsters say, Atlas was asking pilots to take a direct path to Riverside and veer off the normal route.

When Atlas received a complaint about the safety implications of the new route, its dispatchers responded that Amazon had requested it. The airline ultimately acknowledged that the route was invalid, but Kirchner says several pilots had already flown it. Connors reiterated that Amazon may share ideas with airlines, but pilots are responsible for determining flight paths. Atlas spokesperson Debbie Coffey writes, "Atlas, not Amazon, is responsible for route planning."

The Teamsters union and a former Amazon employee worried that Amazon's business objectives sometimes clashed with safety, even in the early days. In late 2016, according to the

former Amazon employee, a squabble broke out between the company and its air carriers over lithium-ion batteries, which can catch fire if not stored properly—a potential hazard that was what likely downed a UPS cargo plane near Dubai several years earlier. The pilots believed Amazon's battery packages weren't adequately labeled, says the employee. The employee adds that Amazon eventually conceded, and workers scrambled to identify products containing the batteries and label their boxes accordingly. Kirchner says that after this, he received reports from the union's safety committee that Amazon was not listing lithium-battery-containing boxes on the flight paperwork. "At certain points, it felt like Amazon was just doing things to see how far they could push the operating envelope," says the former Amazon employee.

Connors disagrees with this characterization, writing, "Amazon marks and labels packages containing lithium batteries in accordance with applicable regulations and through coordination with the FAA. Some packages containing lithium batteries do not require specific marks or labels because they are exempt from such requirements. It is the ultimate responsibility of the certificated air carrier to determine whether cargo has been loaded on each flight in a safe and compliant manner."

This past summer, dozens of ground crew workers walked off the job at a regional air hub in San Bernardino, California. They later went on strike, demanding \$5-an-hour raises and better health and safety conditions, and protesting the deployment of anti-union consultants. Ramp agent Rex Evans says that during a heat wave, when he measured temperatures on the ramp as high as 120 degrees Fahrenheit, managers didn't give workers state-mandated heat breaks until employees spoke out. "[Some] managers' main concern is getting these planes out on time or getting them unloaded on time," he says.

Connors never directly addressed this incident, but she writes that Amazon Air hubs are fully climate controlled, and that the company provides air-conditioned ramp vans and employs safety professionals who monitor the temperature and take extra measures when necessary.

AS AMAZON AIR HAS EXPANDED, it has faced pushback from some of its new neighbors. When Rick and Eugenia Garrity moved to their new Lakeland, Florida, home in 1979, they loved the location of the charming 1923 Spanish Mediterranean house. It was midway between Tampa, where Rick had worked as an environmental scientist, and Orlando, where Eugenia had been an oratorio singer before they both retired. They would occasionally spot turboprops and small private jets flying to and from nearby Lakeland Linder International Airport, but a couple of years ago the Garritys' Floridian idyll was rudely disrupted by a procession of blue and white 767 jets screaming over their backyard, sometimes more than once an hour, every single day. "It's bombing noises. It's tremendous," says Eugenia from the patio of a Starbucks a few blocks from home. As if to punctuate her point, an Amazon jet roars low overhead.

In 2019, the plan to bring Amazon jets to the sleepy airport was under a non-disclosure agreement and known only as Project Scythia. Officials hoped that securing such a valuable client would bring jobs and make the airport more attractive to additional investment, spurring the local economy. An environmental impact review of the project by the FAA found "no significant impact" on the "quality of the human environment." Soon, some 22 Amazon flights a day passed through the airport.

When news broke in 2021 that Amazon planned to double its air traffic to 44 flights a day by 2027, concerned citizens packed a public hearing. Of 20 residents that spoke at the podium, 17 opposed the expansion. The noise was disrupting their conversations, their Zoom meetings, their sleep. "A malignant cancerous growth is threatening

our quality of life here in Lakeland," declared one resident. A middle-aged man chastised his mostly retired neighbors, praising the jobs the expansion would bring and pointing out that two Amazon workers making \$15 an hour would clear a combined \$60,000 a year, nearly \$10,000 above the county's median household income. In any case, their opinions seemed irrelevant: Per the terms of the original lease, Amazon had a right to expand. Residents filed a petition against the FAA with the 11th Circuit Court of Appeals, hoping the court would at least compel Amazon to reroute the planes. That decision is still pending.

Lakeland isn't the only community where Amazon Air's expansion has stoked controversy. The *Los Angeles Times* reported that on December 27, 2019, the Friday after Christmas, airport officials in San Bernardino, California, had announced a vote to be held that Monday on leasing space to an unnamed tenant, which turned out to be Amazon. The company planned to build a 658,500-square-foot air cargo facility with parking for 14 aircraft, 2,000 cars, and 380 trailers. That Monday, officials unanimously ratified the lease. Two days later, a state law went into effect requiring public hearings about new distribution centers.

San Bernardino's largely Black and brown residents already suffered the health consequences of air pollution from the region's high concentration of warehouses and trucks, many of them Amazon's, according to investigations by Consumer Reports and Grist. Once again, the FAA had deemed that the new airport project would have no significant environmental impact. Residents blasted Amazon and its developer, demanding that they agree to guarantee secure, well-paid jobs

➔ An Amazon Air jet makes its descent over suburban Florida.

and fund measures to limit sound and air pollution. In 2020, then-California attorney general Xavier Becerra filed a petition for review against the FAA, the San Bernardino airport authority, and Amazon's developer, alleging that they had ignored potential health risks to the local community. A string of court rulings against the petitioners and refilings followed, with the California Attorney General's Office filing its latest petition in late November.

Likewise, when officials at the Port Authority of New York and New Jersey met in August 2021 to approve a deal for Amazon to lease a 250,000-square-foot cargo facility at Newark Liberty International Airport, protests erupted over the ensuing months. Local environmental groups, labor organizations, and politicians charged that the plan would take away well-paying union jobs and increase pollution in nearby minority communities. Amazon and Port Authority called off the deal in July, citing their inability to resolve unspecified "outstanding issues."

Amazon Air's environmental impact extends beyond the communities where its planes take off and land. It undermines the company's own pledge to get half of its shipments to net-zero emissions by 2030 and to be fully net-zero by 2040. In recent years, Amazon has been heading in the wrong direction; between 2018 and 2021, emissions jumped 61 percent. "We have no idea how much of that net-zero is going to come from actually reducing emissions versus doing carbon offsets," says a member of Amazon Employees for Climate Justice, an activist group of some 900 workers. Studies have shown that offsets frequently cancel out fewer emissions than advertised.

Rhoads touts Amazon's use of electric loaders and other vehicles at its air



gateways as evidence of its commitment to cutting emissions. She notes that Amazon Air was also a founding member of the Aviators Group within the Sustainable Aviation Buyers Alliance, a group of airlines committed to buying certain amounts of sustainably produced fuel.

But some employees say the company could use the technology at its disposal to reduce its reliance on airplanes almost entirely, and thereby lessen its ecological impact. It could invest more heavily in machine learning to improve inventory placement, positioning products closer to customers likely to order them. It could fit more packages into each plane by flying products before they were boxed. It could predict the carbon emissions of various shipment modes and communicate that to climate-conscious customers. It could even limit the number of products it shows customers to those in warehouses within moderate driving distance, as it does when shoppers filter for same-day delivery. But that would mean limiting sales for its third-party sellers, transforming the Everything Store into the Everything Near You Store. By all signs, Amazon is headed in the opposite direction.

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IN MAY 2019, JEFF BEZOS STOOD on the tarmac of Cincinnati/Northern Kentucky International Airport in a crisp blue button-down and aviator sunglasses, flanked by two blue and white Amazon-branded jets and a big mound of dirt. The \$1.5 billion Amazon Air hub was among the priciest signs yet that the company was prepared to invest in building a formidable logistics empire, and Bezos was making a rare appearance at an official groundbreaking. “We’re going to move Prime from two-day to one-day,” he told the Amazon executives, airport officials, local politicians, and media gathered under a white tent, “and this hub is a big part of that.” After showing a video model of a planned sortation center the size of Buckingham Palace—the first in a complex of seven buildings—Bezos exclaimed, “Let’s move some earth!” Donning a hard hat, he climbed aboard a yellow John Deere loader, scooped a heap of dirt off the cement, and dumped it a few feet away.

In the parking lot outside the gates, an uninvited Robert Kirchner, the Teamsters official, was talking to a local news crew. Over the past few years, the Teamsters had regularly protested Amazon—picketing its shareholder meetings, circling its Seattle headquarters with mobile billboards, and threatening to strike. Kirchner complained of an uptick in fatigue calls from union members and spoke about the clash between Amazon’s growing business and the pilot shortage. At the time, Atlas and its pilots were three years into a bitter contract negotiation with each other, a source of frustration for pilots who were among the lowest paid in the air cargo industry. (Last year, after the sides failed to reach an agreement, a third-party arbitrator imposed a new contract and the union elected new leadership.)

According to two former employees with knowledge of the design of the Cincinnati hub, the company took extra care to ensure that the pilots wouldn’t mix with its staff, keeping pilot quarters entirely separate from those used by employees and giving pilots their own entrance to shared buildings. “Amazon is not a union company,” says one of the staffers. “So that was always part of the conversation. They wanted to make sure that these union pilots weren’t necessarily interacting with their nonunion workers in their buildings.” Amazon calls this claim baseless and says separate pilot lounges are standard within the industry. (Nevertheless, in November, Amazon’s ground crew employees at the facility announced they were launching a union campaign.)

Construction of the hub grew chaotic, former employees say, and several project leaders left before its completion. Amazon had set an ambitious timetable for the project, and unanticipated hiccups—like a discovery that the building site’s soil held too much water—led to tens of millions of dollars in unanticipated costs. But Amazon’s sheer size also conferred benefits. Its large public policy team massaged relationships with local governments. The sheer number of jobs created by an Amazon project gave it a lot of sway, says a former employee. “That’s how they were always able to get support from local officials, and even state officials.” The Cincinnati hub opened in August 2021, just under the deadline Amazon had set for itself, according to employees who worked on the project.

“When they decided they were going to build an air service, they wanted to cover the whole US within three years, and they did it,” says a former employee. “Amazon was proud of the fact that what FedEx and UPS built in 20 years, they did in three.”

But according to four former air employees, this explosive growth came with a fair amount of underfilled planes, especially during non-peak periods. What’s more, many of the packages that traveled by air could have reached their destinations on time by ground, they say. Amazon has an internal program that decides how each package is shipped. Generally, it chooses the cheapest option that delivers the package on time. But



several former employees say that since the leases on planes were already paid for, the program was configured to drive more volume to Amazon Air than would have been the case if the full cost had been accounted for.

Two former air employees recall items flying from Seattle to the Cincinnati hub, then back west to Portland—a two-and-a-half hour drive from its northern neighbor. While Amazon says it uses airplanes for items located too far away to drive, ex-employees say the company often flew widely available items, such as toothbrushes and iPhone chargers.

“At UPS, they say ‘Don’t fall in love with the airplanes,’” says one former air employee. “At Amazon Air, they seemed to have fallen into that trap.”

Connors writes that the company is constantly optimizing to operate the most sustainable and efficient network possible. “This includes aircraft load factors, which are dependent on weight, volume, routing, staffing, facilities, and a complex mix of other network planning factors. Ground transportation will be prioritized to meet our customer promise.” When asked about Amazon’s use of airplanes for common items as part of an additional round of fact-checking questions, Connors stopped responding, saying the company had “nothing further to add.”

One way to offset the costs of unfilled planes is to sell the excess capacity to other companies. “The universal model at Amazon is you create a big internal client for whatever service it is you’re building, and then you offer it to the rest of the world. That was the model for Amazon Web Services,” says a former Amazon Air employee, referring to the cloud computing division that powers Amazon’s logistics system. “It makes sense, if you’re going to build this huge internal transportation network, to turn around and offer it to third parties.”

But aside from a deal to fly packages for the US Postal Service, which began in 2017, former employees say that selling spare air capacity has proved more challenging than selling space in the cloud. When employees raised questions about that potential, management would say, “Let’s focus on getting our own house in order,” recalls one former employee.

Asked about Amazon Air’s plans to sell its service to others, Rhoads demurs. “Our capacity that we plan right now is for Amazon customer shipments. Could that change over time? I never say never, with Amazon.”

Recently, the company has begun to face a reckoning over its “get big fast” mentality. A tanking stock price, slowing revenue growth, and economic uncertainty have ushered in a period

of belt-tightening as new CEO Andy Jassy took the reins from Bezos this past summer. (Bezos is now executive chair.) Jassy acknowledged that the company had overbuilt in response to pandemic demand, and he has closed, canceled, or delayed plans to open more than 80 facilities in the US, according to MWPVL International, a supply chain consultant that tracks Amazon networks. June saw the resignation of Dave Clark, the executive who oversaw Amazon’s massive logistics buildout, followed by that of Dave Bozeman, Rhoads’ boss, who oversaw Amazon Transportation Services. In November, *The New York Times* reported that the company planned to lay off 10,000 employees, the largest cuts in its history.

While Amazon Air continues to add flights, its rate of growth slowed from 30 percent in 2021 to about 5 percent during the first half of 2022, according to data from Cargo Facts Consulting. The consultancy also found that Amazon’s shipping and fulfillment costs have outpaced revenue growth for the past five years. Investments in air continue, however. In October, Amazon announced a partnership with Hawaiian Airlines, which will operate Airbus A330s, a type of aircraft not yet used by Amazon, on the retailer’s behalf.

Meanwhile, the company still entertains one of the earliest roads-not-taken. Multiple former employees say Amazon has held meetings over the years about the possibility of acquiring one of its carriers and launching its own airline—preferably with non-union pilots.

The birth of Amazon Air stemmed from the company’s desire to free itself from the constraints of its shipping partners, control its destiny, and better serve its customers. By sheer force, and perhaps some luck, the retailer hasn’t faced another Christmas crisis since 2013. And despite headwinds, it continues to load massive 767s with its signature boxes every day. Amazon is even looking ahead to the next, slightly smaller frontier: The company says it will start making deliveries by drone in two towns by the end of the year.



“I’M

PEDRO PASCAL CARES ABOUT

NOT

YOU.

A

HE’S ALSO SELF-CONSCIOUS ABOUT CARING ABOUT

TOUGH

YOU.

THIS IS EXACTLY WHAT MAKES HIM GREAT.

GUY.”

BY HEMAL JHAVERI

PHOTOGRAPHS BY PETER YANG



P

PEDRO PASCAL is a little *too* nice, actually. Too many hugs. So many polite refusals of snacks. On the set of a photo shoot for this interview, there's an evident tension inside him. He retreats into the aloofness of celebrity, but he is also eager to connect. He seems to enjoy having his picture taken, but he gets shy when the photographer moves in for a close-up. It's in his nature to be open, but he holds a lot of himself back. He's not too far off, in fact, from the anonymous bounty hunter he plays in *The Mandalorian*. He wants to take off the mask and let people see his face, but he doesn't want to deal with the fallout.

Too bad. Not only is Pascal returning for season three of *The Mandalorian*, he's also starring in HBO's *The Last of Us*, probably the biggest video-game-to-TV adaptation of all time. In that now oh-so-recognizable face of his, one senses, well, shock. It's unthinkable—magazine covers, TV stardom, all of it—for a kid who wrapped himself up in '80s movies and late-night HBO after his family fled Augusto Pinochet's dictatorship in Chile, seeking political asylum in Denmark before eventually ending up in the United States. Pascal always dreamed of being a performer, yes. And he spent years kicking around with small television roles and New York theater gigs before getting his eyes gouged out in *Game of Thrones*. But he never imagined becoming Hollywood's go-to reluctant father figure. You know, *famous*.

Maybe that's why Pascal now seems chiefly concerned with making those around him feel comfortable. When the shoot runs long, cutting into one-on-one time, he assures me he'll stick around to talk. And he does, for much longer than his schedule is supposed to allow. I get the feeling he's just excited to finally be sitting at the cool kids' table—Ethan Hawke! Nic freaking Cage!—and doesn't want to do anything to mess it up. Like most celebrities, there's a part of him that is a little insecure and hungry for validation; even an offhand compliment about one of his performances seems to set him at ease. He's most engaged when we talk about his family and politics. It comes through in his voice, his body language, a cleverly deployed arched eyebrow. He cares so much. He's also uncomfortable caring so much.

This is, I suspect, the source of his powers—that empathy at his core, visibly competing with the tough-guy exterior. Unlike most hero types these days, whose bodies glisten with smoothed-over perfection, Pascal has aged into his face. Whatever he lacks in shine, he makes up for in grit: His broad features and salt-and-pepper facial hair lend him a grizzled, protective air. In *The Last of Us*, he plays Joel Miller, a father in a postapocalyptic zombified wasteland dealing with loss both personal and global. The performance flicks between menace and heartbreak, infused with deep feeling—a natural ability to find the humanity at the heart of a conflicted hero. That's Pascal. *Our* conflicted hero. Empathy hugs and all.

WIRED: You seem to be picking parts—the Mandalorian, Joel in *The Last of Us*—that play very intentionally into a tough, conflicted outsider status. But maybe that's too neat and tidy?

PEDRO PASCAL: I find it funny when anyone applies choice to my experience. Of course you can say no to things, but you can't say no to Jon Favreau, Kathleen Kennedy, Dave Filoni, or HBO. It never felt like stopping and considering what the characters were. It was simply the circumstance of a door opening and stepping through it.

So there was nothing specifically tempting about *The Last of Us*?

To be totally honest, it was wanting to work with Craig Mazin, who did *Chernobyl*. Also, HBO is content that I literally grew up on. I experienced their original programming. Their original programming was very, very mature.

You mean, like, the after-11 pm original programming.

Absolutely. And I saw all of it, which is pretty nuts.

Your parents didn't care?

Obviously there's a variety of immigrant experiences in the US, but it tends to be really strict in one way and really open in another way. If my parents liked what they were watching, they rarely sent me out of the room. But I had to get good grades or I wasn't allowed to watch shit.

Same here—get good grades, do whatever you want.

They didn't take TV seriously as something that would influence our choices. But basically, I developed a real big dream about being a part of something that would be important to a network like HBO.

So how'd you prep for *The Last of Us*? Did you play the video game?

I hadn't heard of the game. Their instruction was: *Don't play the game*. I ignored them. I tried to play the game, and I was very, very bad at it. (But my nephew was fantastic.) It was important to me to play notes that were directly related to what was originally in the game—physically, visually, vocally.



PEDRO PASCAL DIDN'T MAKE IT BIG UNTIL HIS FORTIES. NOW HE WANTS TO TAKE CARE OF THE FRIENDS WHO SUPPORTED HIM THROUGH LEAN TIMES.

Did you bring anything personal to the role?

That's the fun part—how much you get to externalize internal darkness in a safe way and bring in things that are from your nightmares.

Such as?

Joel's capacity for violence, and being good at it. I didn't get into any physical fights growing up, and definitely not as an adult. Violence scares me tremen-

dously. Is it the fear of violence in general? Is it the fear of your own violence?

Or maybe the fear that you'll like it?

Totally. I love thrill-seeking stuff. But I don't make a practice of testing my limits. I'm actually a little bit opposed to it. I don't like pain.

Meaning physical pain?

Pain of every kind. I don't like psychological, emotional, or physical pain. Some people will be like, *Oh, I know that it's very likely I'll break something, I've got to try that*. Fuck. That. I don't think of myself as—I'm not a tough guy.

Really?

I don't live that way. I'm a lubricant. I want people to feel comfortable. I don't know how to function at the expense of anyone's comfort level. I'm a people pleaser.

I see some of that on social media, where you seem to do everything you can to make, say, the sci-fi fandom more welcoming and inclusive. You're very supportive of your sister, for example, who came out as trans in 2021. How are you navigating your role in political spaces?

Total improvisation and ultimately just erring on the side of, like ... [*very long pause, two deep sighs*] My entire heart is set on, you know, the marginalized underdog. It's not a choice. Like, how dare anyone not support the people that are deserving of support, and are deserving of protection and need more of it than you do. Do you know what I mean?

Yeah, but some actors would say, *My star is rising, I don't want to get involved with this*.

Maybe if you pause to think about it, it could keep you from doing the right thing. And this feels like the barest minimum. Like, the barest minimum.

You mean an Instagram post isn't enough?

No, it's not. My personal hope is to seize the opportunity to be of service in ways that are true. I'm keeping my eyes open. The truth is that I don't think I do nearly enough. I'm, like, a LIB-ER-AL, but there are contradictions there as well, because

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we live capitalistically. I guess we carry, you know, the weight of that shame?

The weight of capitalist shame? The fact that you make money is a bad thing?
Kind of?

You've had late-career success. You were consistently working—

I was consistently working, and it was a total struggle in such a typical way, but there was always somebody that would be able to bail me out—to help me pay my rent or help me get groceries.

But now you must be rolling around in all your money like Demi Moore.

[Laughs] Demi Moore in *Indecent Proposal*?

Yes.

I don't have the *bod* for that. She's basically the only one who could pull it off. Yeah, I get my cash. I spread it all over my bed and I roll around in it.

I knew it. But seriously, how do you think about your recent stardom?

I didn't get *Game of Thrones* till I was in my late thirties. And therefore, the amount of times I was helped, and the amount of people that I could rely on through some really tough times—I'm never going to let some of them ever buy dinner again. I want to take care of people as much as they took care of me.

Who helped you?

There's the family that my older sister sort of acquired. And then also by becoming part of a theater community that really looks after itself.

You have some famous friends too.

Does that mean we have to talk about Oscar [Isaac]?

The internet loves this friendship.

I met him through a play we did together in 2005. An off-Broadway show where we were getting \$500 a week, before taxes.

Do you have a favorite memory of the two of you?

There's so many. He's so naughty. His level of naughtiness onstage during that play, for example. He played a ghost,

which meant that the living characters in the story could not see him. I had to do my scenes, and he would physically be there, but because my character couldn't see him, he could fuck with me, all in front of live audiences, as much as he wanted, trying to get me to crack up or forget my lines. The memory is simultaneously dark and wonderful.

Would you say you tend to be a hopeful, forward-looking guy?

We have to hope. But I'm too privileged. You know what I mean? Like, I'm too lucky. It's an interesting thing. The reason my older sister and I grew up in the States is because my parents fled a military dictatorship. So, you know, only 10 years after my parents were in hiding, I was crying because *The Breakfast Club* was checked out at the video store.

But I'm guessing there were also challenges?

Looking back, so much of it only seems to present itself as an opportunity. When my parents ended up on a list of pardoned exiles and were able to go back to Chile, it came with enormous families on both sides, which was missing from the experience of growing up in the States. I guess it's only in middle age where it feels like it can be emotionally challenging to accept that there isn't anywhere to plant my flag as an individual. Everywhere is home and nowhere is home. But that also still feels like a good thing to me. It's often framed as a disadvantage in our culture, but it's an advantage in character, and in perspective, and in outlook.

Do you think that if you had popped into national consciousness when you were younger, you would not have wanted, say, a traditional Marvel role—the cape and the CGI and all that?

But I do want that. I want to be in movies.

But the world's in a fairly tense political moment right now. Does that change what it means to be a hero?

There's so many ways to misunderstand people and to forget that, at the end of the day, your neighbor is very likely to give you the shirt off their own back. The interchanges that you have with strang-

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—PEDRO PASCAL



JUMPSUIT: HERMES (FIRST AND THIRD PORTRAITS); SHIRT AND TROUSERS (SECOND PORTRAIT): BRIONI; BOOTS: GIANVITO ROSSI

ers are, more often than not, human. But then you can go and look shit up and be terrified by how divided we all apparently are. To comfort myself, I just remember that everybody I come in contact with is sort of, in their own way, heroically kind.

In some ways, you're the face of that new kind of hero.

Oh my gosh. It's funny when the phrasing "the face of" comes up, because Mando is faceless. I haven't thought about it in that way. I'm always struggling to imagine myself as being a part of something that I have been witness to growing up and watching. There's a disconnect for me—I don't know how to place myself in that world. Like, I just go a little blank.

Then talk about your character in *The Last of Us*. Joel can be a little scary.

I think what's scary about Joel is that none of us really know what we'd be capable of if faced with the idea of losing love. Whether it's conscious or unconscious, being alive or even being a human being is directly connected to the love you feel. Existing is connected to the love you feel toward a particular relationship—your child, your partner—and to lose that? Some people are not capable of applying rational thought to that kind of loss, or the threat of that loss, or the threat of that loss again, right?

That's what makes you human.

That's what makes you human *and inhu-*

man. It's such a beautiful question that the video game poses. I avoid all of it by not having kids. And staying out of relationships.


Do you want kids?

I don't know.

You're close with your nephews.

Well, yes. Only because they were so good at playing *The Last of Us*. No, I'm just kidding.

It's funny then, or at least a bit ironic, that you keep getting cast as these reluctant father figures.

I love being ... I like being able to imagine it. 

Defusing THE Car

View of
Georgetown,
Guyana.

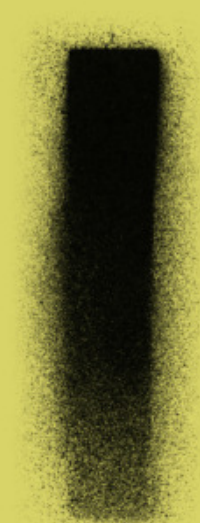
Photographs by Tom Vieras



Big Oil Boom Bomb

Since 2015, Exxon has discovered 11 billion barrels of oil off the coast of Guyana. Now one lawyer is going up against the petroleum behemoth—and her own country—in a bid to stop the drilling before disaster strikes.

by Antonia Juhasz



IN LATE JUNE, inside a squat concrete building in Georgetown, Guyana, on a noisy street flanked by telephone repair shops and beauty supply stores, two lawyers were waging one of the most significant legal battles in the global fight against climate change. Melinda Janki and Ronald Burch-Smith sat in a ground-

floor office staring intently at a computer screen, ignoring the sounds of macaws, monkeys, tree frogs, and traffic packing the streets, waiting to connect to the country's Supreme Court via Zoom. The internet is unreliable at best in Guyana's capital city, and the fear that it would choose today to conk out was palpable.

The two lawyers were a bit of an odd couple. Burch-Smith is tall and meticulous. Ask him if he knows the time and he's likely to answer "yes" rather than divulge the hour. Janki is a petite woman with warm eyes and a sharp wit, quickly moved to rigorous denouncements of injustice, from the war in Ukraine to the plight of the planet to the litter on the street. Burch-Smith has a framed *Phantom of the Opera* playbill above his desk. The art in Janki's office is a little more confrontational: a life-size painting of a fierce yellow jaguar that appears poised to step out of a blackened forest and straight through the picture frame. Together, the two attorneys have mounted a novel and audacious attack on Exxon Mobil, one of the world's largest corporations with the legal muscle to match.

In 2015, Exxon, which is known in Guyana as Esso, struck oil off the coast, the first significant find in the country's history. The scale of the discovery, 11 billion barrels so far, landed Guyana on the list of the world's top "carbon bombs"—fossil fuel projects capable of releasing more than a gigaton of carbon dioxide. Exxon ultimately

plans to produce more than 1 million barrels of oil a day. That would transform Guyana—currently a carbon sink thanks to its dense blanket of rain forests and minimal emissions—into one of the world's top 20 oil producers by 2030. An Exxon Mobil spokesperson says that during the world's transition to cleaner energy, "we need two things at the same time: reduced emissions and a reliable source of energy. Exxon Mobil has a role to play in both." By 2027, Exxon expects its Guyana operations to have "about 30 percent lower greenhouse gas intensity" than its average oil or gas production. Climate experts estimate that 2030 is also the year by which much of Georgetown and coastal Guyana will be underwater as a result of unchecked global warming. Those living in the interior of the country will face the devastating impacts of worsening droughts and floods, from intensifying food insecurity to loss of land and homes. In 2021, Janki and Burch-Smith sued the Guyanese government for giving Exxon the green light. Exxon later joined the government as a codefendant in the case.

Georgetown's lush beauty—its neighborhoods teem with tropical flowers in scarlet reds, peacock blues, sun-kissed yellows, and turquoise greens—is made possible by its abundant sources of water: Rivers and canals carve paths through the streets, carrying water from the Amazon to the Atlantic, along whose coast most of the city—and 90 percent of the nation's population—resides. Viewed differently, though, the abundance of water is a sign of Georgetown's particular vulnerability to climate change. All around is the evidence of an impoverished city that is rapidly industrializing. Newly traffic-clogged streets strain to make room for horse-drawn carts; cows graze on street corners near Popeye's and KFC. Many homes and buildings have that beaten-down look common to places of either war or extreme weather.



To call the Exxon lawsuit a David-versus-Goliath endeavor would be an understatement. When several US state attorneys general sued Exxon about five years ago for misleading investors and the public about the risks of climate change, a judge joked about the oil company, “Y’all have 300 lawyers on your side.” Exxon then submitted more than 2 million pages of records to just one New York court. By contrast, Janki and Burch-Smith had one legal assistant. Janki has been known to stand in long lines at the court to file pleadings. She has also carted around enormous files filled with thousands of pages of material, which she reads without the assistance of a litigation team.

In the June hearing, Exxon was attempting to throw out virtually the entire testimony of one of Janki and Burch-Smith’s clients on the grounds that he was not a climate scientist. When the judge appeared on the screen, he gave the pair more time to present their argument to keep the affidavit, which rests on key facts regarding fossil fuels and climate change, before the court.

Halting the project would deal Exxon a crippling blow; within eight years, Guyana is on track to become the company’s single largest site of daily oil production. But it could also have implications for the global industry. Whereas climate lawsuits against fossil fuel companies have typically attempted to hold those corporations accountable for the harms of past operations, this one in Guyana seeks to force the company and the government to accept responsibility for the damage they will cause in the future. The case argues that oil development is fundamentally incompatible with human health and a sustainable environment. If successful, it could set an example for climate activists in other countries.

With its lush forests,
Guyana is a carbon sink.
Exxon’s project stands
to make it a carbon bomb.

To call the ground-breaking lawsuit against Exxon a David-vs.-Goliath endeavor would be an understatement.

Kneecapping a global energy giant might sound like an impossible feat for two attorneys in a Global South nation with a population of less than 780,000 people. But they are wielding some powerful tools. Guyana happens to have some of the most robust environmental protections in the world. Its constitution contains provisions that explicitly protect the rights of citizens—present and future—to a healthy environment. “Virtually every aspect of this operation is in violation of Guyana’s constitution, and the right to a healthy environment, and the right of sustainable development, and the rights of future generations,” explains Carroll Muffett, the president and CEO of the Center for International Environmental Law. “And from that arise serious consequences in terms of how the government must respond.”

“The provisions are groundbreaking,” Janki says. She should know—30 years ago, she helped author them. Plus, Janki’s knowledge on the matter has still another layer: Early in her career she spent four years working for the oil giant British Petroleum, now known as BP.

Melinda Janki's visionary work introduced the concept of natural capital to Guyanese law—and challenged the dominance of gross domestic product.

J

ANKI GREW UP in Georgetown, in a house close enough to the Atlantic Ocean for the sounds of waves to lull her to sleep each night. Much of her childhood was spent outdoors, where she developed an affinity for the water and the forest. When she was 5, a small brown dog appeared on the front porch in the bright rays of

the early morning sun. Janki was reading a book of Christian fables at the time, so she named her first beloved pet Lucifer, Son of the Morning. "The story ends very badly," she recalled. "He must have gotten out and been on the road outside the house, and someone knocked him down and killed him." Janki was crushed—and furious. "It taught me the lesson that life is tenuous," she says, and also "to fight for the little underdogs." She would go on to care for dozens of stray animals, including dogs, donkeys, cats, horses, wild birds, and a baby giant otter.

Janki's family left Guyana in the 1970s, when she was 12 years old and the country was in a period of intense political instability. After living in Zambia and Trinidad, Janki eventually settled in London. She studied law at Oxford and University College London, focusing on human rights, environmental and economic law, and intellectual property. She began her career at one of Britain's premier corporate law firms, Lovell, White, & King—"otherwise known as 'Lovely, White, and Clean,'" Janki quips—where she recalled being one of the first non-white trainees. She left the firm in 1989 to become an in-house lawyer at BP's world headquarters. Janki doesn't speak negatively about her experiences working there, but over time her growing condemnation of the industry has come to dominate both her life and work.

It didn't take long for the shine of London to wear off. On the 30th floor of a skyscraper, Janki felt entirely cut off from nature. Her life started to seem all too comfortable. "You know, comfort is a form of suicide," she says. After four years absorbing the inner workings of the oil industry, she decided to leave. Janki returned to Georgetown in 1994, a time when her homeland seemed brimming with promise. "Your heart tells you what you should be doing, and it just tugged me back to Guyana," she says.

G

UYANA'S NAME IS said to derive from an Indigenous word for "land of many waters." The largest of the country's rivers, the

Essequibo, begins at the Acarai Mountains near the Brazilian border and flows north through forest and savanna, cutting a straight line for 630 miles across the length of the country. As the Essequibo makes its way to the coast, it's joined by tributaries of the Amazon, Rupununi, Mazaruni, and Cuyuni rivers, all carrying a rich bounty of sediment filled with nutrients. Guyana's ocean contains some of the highest recorded levels of chlorophyll biomass in the world. In turn, the waters are home to more than 900 species of fish, essential to both local subsistence and the Guyanese economy. There are also dolphins, manta rays, sperm whales, and six kinds of marine turtles, some of which are endangered.

In the interior, nestled between forests, picturesque mountains, tributaries of the Amazon, and the headwaters of the Rupununi river, rests the virtually untouched savanna that the Wapishana and Macushi call home. They are among the nine tribes collectively referred to as Amerindians, who have lived in and around present-day Guyana for millennia. Most live subsistence lifestyles based on hunting, fishing, and farming, not all that different from those of their ancestors.

For centuries, a rotating list of foreign powers extracted Guyana's natural resources and returned the products and profits to their home ports. In 1667, to secure their claim on Guyana, the Dutch traded parts of modern-day New York and New Jersey to the British. The Dutch enslaved Africans to work the sugarcane fields and pushed many Indigenous peoples into the interior to give themselves easy access to the sea. Almost two centuries later, Britain took Guyana by force. It became one of the

empire's most lucrative colonies, powered first by slavery and then the indentured servitude of people from India, China, and Portugal. An 1823 rebellion led by enslaved people in Guyana is credited with contributing to the eventual abolition of slavery across the entire British Empire; in 1917, people in indentured servitude in Guyana successfully organized to force an end to that practice as well. In the 20th century, American corporations came to Guyana, mining for bauxite and gold. By the 1950s, they also hunted for oil, but decades of effort proved largely futile.

In 1992, Guyana held its first free and fair democratic election in decades. The new government, led by the leftist People's Progressive Party, was eager to protect the country's natural resources after centuries of colonial exploitation, and it saw environmental protection as part of a broader mission to secure social justice. At the time, Janki had just returned and been admitted to the national bar. She had no party affiliation or political connections. She was, she says, a "nobody." But, in 1995, when Janki learned that the nation's first-ever environmental laws were going to be drafted at an invitation-only conference, she knew she had to be there. A partner at the law firm where she worked was also the owner of one of Guyana's two national newspapers, and he helped Janki finagle a press pass.

The conference was held at the Pegasus Hotel, a seven-story cylinder of blue glass and white steel that towers above Georgetown. No press accounts of the event can be found, and many of the participants have since died, but Janki recalls that there were about 100 attendees, most of them men, who droned through a series of forgettable presentations. What did catch her attention was the draft Environmental Protection Act. "When I got a look at what they were writing, I was absolutely horrified," she says. In her view, the legislation was far too weak.

During a coffee break, Janki spied a special adviser to the president, Lakeram Chatarpaul, standing alone outside of the conference room. Janki was a lot shier then, she says, but in her recollection she "lobbied like mad and made quite a nuisance of myself." Chatarpaul invited her to write to him. What she wrote worked: After he read her ideas, Janki was hired by the Inter-American Development Bank to draft the new law for the government.

Over many months, Janki adapted what she felt were the most robust environmental laws from around the world and "put in a raft of new provisions," she says. She included the "polluter pays" and "precautionary" principles, which hold com-

panies liable for the costs of cleaning up pollution and the government responsible for implementing measures to prevent environmental harm, even in the absence of "full scientific certainty." Importantly, Janki defined the "environment" to include, among other things, the atmosphere and climate. "This was in 1995, when people were relatively unconcerned about greenhouse gas pollution, and the carbon majors were misleading people," she says. She imbued the Environmental Protection Agency with significant authority, including the requirement that any proposed project, from mining to construction, had to include a detailed environmental impact assessment. If the assessments were found to be lacking, the EPA would have the power to reject projects outright, as well as the ability to put conditions into permits to ensure that the company's operations did not conflict with Guyana's international human-rights and environmental obligations. She also included far-reaching provisions for public access to information, participation, oversight, and compensation for harm, plus some other "visionary stuff in the act that nobody noticed."

One striking example of "visionary stuff" was the introduction of the concept of natural capital into Guyanese law. Each year, the EPA is required to take a full accounting of the nation's ecosystem—from wildlife to vegetation—and make it publicly available. This creates a baseline from which to measure both ecosystem value and potential harm. Natural capital is a direct challenge to gross domestic product, or how much a country produces, consumes, and exports—the prevailing measure for assessing a nation's economic health. A rising GDP is often considered inherently positive, regardless of the human or environmental costs. When a forest is clear-cut, for instance, GDP increases due to the labor and machinery used and the timber sold. Natural capital, by contrast, considers the value of the trees to the climate, the animal species, and the people who call the forest home. Under this model, the forest's destruction is a cost and its protection a benefit. While Janki's law doesn't require this entire calculation, simply introducing the concept was a significant step, which several other nations, including Botswana, Colombia, and Egypt, have since embraced.





IN 1995, cyanide-filled mining waste spilled into the Essequibo River, killing fish and other animals and polluting the cropland on which Amerindian communities relied. The spill and others like it were attributed to a lack of meaningful environmental regulation, and they galvanized the nation to support the Environmental Protection Act, which was signed into law on June 5, 1996.

Two years later, the government turned to rewriting its constitution and solicited public submissions. Seizing the opportunity to embed strong environmental protections within the constitution itself, Janki wrote what she has described as “a statement of the obvious” that was ultimately included in the preamble: “The well-being for the nation depends upon preserving clean air, fertile soils, pure water, and the rich diversity of plants, animals, and ecosystems.”

But it was the provisions that Janki lobbied to be included in the text of the constitution that were the most significant. Drawn largely from South Africa’s new postapartheid constitution, they conferred upon every Guyanese citizen “the right to an environment that is not harmful to his or her health or well-being” and would hold the state responsible for protecting the environment for the benefit of present and future generations. They also required the courts to “pay due regard to international law, international conventions, covenants, and charters bearing on human rights.” These include human-rights obligations to clean air and water, life, and livelihoods. Taken together, these constitutional provisions are far stronger than the environmental protections found in most northern nations, including the US. “I don’t want to sound as if I am showing off,” says Janki, “but, really, it is all there.”

A few years later, an Arecuna tribal leader from the Upper Mazaruni area came to Janki’s law office seeking help to confront continued abuse from the mining industry. Janki turned her attention to building and securing the rights of these communities. She also worked as a consultant in drafting the 2006 Amerindian Act, providing for collective rights to land, natural resources, and self-determination. In academic and legal journals, she made the case that failing to fulfill human-rights obligations to life, health, water, food, nondis-

crimination, and self-determination, including the rights of local communities to consent to policies and programs that directly affect them, “can be a trigger for environmental destruction.” She also contributed to the drafting of the Escazu Agreement, the first regional environmental treaty of Latin America and the Caribbean (ratified by 14 nations but open to all 33), “contributing to the protection of the right of every person of present and future generations to live in a healthy environment and to sustainable development.”

Janki had expected that when the time came, Guyana’s government and citizenry would make use of the strong legal foundation she had helped build. She would soon learn that, at least when it came to oil, she was wrong.

IN MARCH 2015, the Deepwater Champion rig was at work for Exxon Mobil, exploring for oil in the Atlantic Ocean 120 miles off the coast of Guyana, drilling below 6,000 feet of water and through 12,000 feet of earth. Ultra-deepwater drilling is so complex that experts liken it to space travel, and the dangers are well known. Five years earlier, the Deepwater Horizon rig was at work for BP when it exploded in the Gulf of Mexico, killing 11 workers and setting off the worst offshore oil spill in history. (The rig in Guyana was owned and operated by the same company, Transocean, that ran the rig in the Gulf.)

Only two months after it began exploring, Exxon struck oil. The first significant find in Guyana’s history came as a shock. Exxon Mobil’s then CEO, Rex Tillerson, told shareholders it was the largest oil find anywhere in the world that year. The Guyanese government, led by President David Granger of the People’s National Congress Reform, quickly signed a contract with Exxon and awarded the company a series of 23-year permits—which were at the time withheld from the public. When production began four years later (“a fraction of the time it usually takes,” according to Exxon spokesperson Meghan



Guyana's waters sustain over 900 species of fish, essential to local subsistence and the economy.

MacDonald), Guyana was officially ushered into the exclusive club of oil-producing nations. President Granger proclaimed it National Petroleum Day and said the discovery would transform the country's economic development and ensure a "good life" for all.

The People's Progressive Party, led by Bharrat Jagdeo, accused Granger of signing a one-sided deal with Exxon in exchange "for peanuts." Industry analysts have found that the government is receiving a below-average return on Exxon's projects. Exxon will recoup all of its expenses, including all development and operating expenses, out of the oil it extracts, leaving the government and public to largely absorb the company's costs. For every barrel of oil produced, until it recovers its costs, Exxon receives 85.5 percent of the value of the oil compared to Guyana's 14.5 percent, according to the Institute for Energy Economics and Financial Analysis.

Exxon maintains that the contract terms are competitive and that it "provides a structure and terms that are equitable to both the government and investing companies, commensurate with the risk associated with each project."

Janki, meanwhile, set her sights on scuttling the entire Exxon operation in Guyana. "At that moment

nobody else was willing to challenge what the oil sector was doing," Janki says. In 2018, she realized she would have to go to court.

Janki filed a suit, based on the Environmental Protection Act, arguing that the government had acted illegally by granting production licenses to the two companies that Exxon is partnering with, as they had not filed their own environmental impact assessments. The judge ruled that the license granted to Exxon was sufficient, but Janki was not dissuaded. She began giving talks and lectures, arguing that there were grounds to challenge Exxon's operations, and she soon found a kindred spirit in Troy Thomas, who was then president of the Transparency Institute, the nation's leading anti-corruption organization. In time, he would become one of her most important collaborators.

When Exxon started operating in Guyana, Thomas, like Janki, worried that the corrupting force of oil money would threaten the country's meager political gains of the past few years—the dreaded "oil curse." Countries that depend on exporting oil are among the most economically troubled, authoritarian, and conflict-ridden nations in the world. Terry Lynn Karl, a professor at Stanford University, documents how, in the

Janki expected Guyana to make use of the environmental protections she instituted. When it came to oil, she was wrong.



Heavy rainfall in Guyana is nothing new. But now the rainy seasons are longer and wetter, and the dry seasons are hotter, with intensifying drought.

“

I don't see how we can agree to kill ourselves,”
Troy Thomas
says about Guyana's decision to drill for oil.

past 40 years, the consequences of becoming oil-rich—far from the promise it offers—have tended to be more destructive than positive. Thomas was well aware of this, as well as of the growing efforts worldwide to shift away from fossil fuels altogether. “We know that petroleum is a dead end,” he says.

Globally, as of 2015, the fossil fuel industry and its products accounted for 91 percent of all industrial greenhouse gas emissions, and about 70 percent of all anthropogenic greenhouse emissions. Since 1988, more than half of all global industrial greenhouse emissions can be traced to just 25 fossil fuel companies. Exxon Mobil is number five on the list compiled by the CDP Carbon Majors Database.

Thomas grew up on Wakenaam, an island with a distinctly Caribbean feel that's just a short boat ride from Georgetown. His father was a small farmer like most of the island's inhabitants, growing crops like plantains, cassava, and tubers. Wakenaam is surrounded by a seawall built by the Dutch to keep the water out. But “wall” seems too generous a word for the roughly 4-foot-high crumbling ledge. It worked for a time, but the sea has been rising, and the storms are now worse, regularly inundating the island's homes and fields. “The

ocean just has to decide one day: ‘I'm going to be disruptive.’ And that's it for the island of Wakenaam,” Thomas says. “It's not a theoretical, conceptual argument. It's right now.” It didn't make any sense to him that the government actively welcomed a project whose massive emissions contributed to the sea-level rise that threatened his own family's very survival. “I don't see how we can agree to kill ourselves,” he says.

Thomas, who often wears a dress shirt and blazer, with his hair in a loose ponytail of shoulder-length dreadlocks, is a professor of natural sciences at the University of Guyana. As a father of two young children, balancing family, work, and a political activism that is rare in this small nation, Thomas usually gets no more than a few hours of sleep each night. He understands why many, if not most, people in Guyana find it difficult to speak out against the government and its major partners. Guyana's political history has a violent side, including the assassinations of famed anti-colonial scholar and political activist Walter Rodney and one of the nation's agricultural ministers. Political and economic retribution can also be vicious, instilling fear and limiting action, Thomas explains.

Thomas' organization succeeded in making Exxon's contract with the government public in late 2017, an effort that brought him into conversation with Janki. Thomas felt he had reached the limitations of traditional advocacy to stop Exxon, and he was intrigued by Janki's novel, but potent, legal approach. He decided to join forces with her.

In May 2020, Janki filed a new suit against the government on Thomas' behalf. She argued that the 23-year permits violated the Environmental Protection Act, which stipulates that the government may grant only five-year leases for oil drilling. In a settlement, the EPA agreed to reduce the terms to five years, after which Exxon would need to reapply for new permits. This was a major victory, but it didn't address the roots of Thomas' deeper concerns: the increasingly existential threat of climate change.

And so, emboldened by their success, Thomas and Janki began to lay the groundwork for an even more ambitious case against Exxon, which others would soon join.



UADAD DEFREITAS IS Janki's second client in the pending case against Exxon. The 23-year-old with boy-band good looks is Wapishana and grew up in the Rupununi region in southwest Guyana, near the border with

Brazil. As a child, he split his time between the village of Katoonerib, where he attended primary school, and the cattle ranch where his family worked. Among its limited modern attributes, the ranch has used solar panels for decades. DeFreitas works on conservation efforts in the region. "There are so many animals!" he says effusively. "Birds, otters, monkeys, caiman, jaguars—you cannot list them all!"

Today, his family has a small cattle ranch and a budding ecotourism business of its own. But DeFreitas worries that the already devastating effects of climate change threaten not only his family's businesses but the future of his 4-year-old brother—and his ability to call the Rupununi home.

Heavy rainfall in Guyana is nothing new. "People live on the land, they know where the water usually comes, and they plan their farms and houses because of that knowledge," DeFreitas explains. But now the rainy seasons are longer and wetter, and the dry seasons are hotter, with intensifying drought. All year round, the weather is unpredictable, and it's getting worse. Wells and ponds are running dry, leaving families without drinking water or fish to eat; the river both swells and dries out well beyond the norm; and floods increasingly destroy crops and villages.

One rainy day, I visited a small plot of land in Katoonerib near DeFreitas' primary school. Huts made of brown earth and thatched roofs hand-stitched from tree fronds dotted the horizon. A farmer removed an ear of corn from the stalk and, with the deft precision that comes from decades of repetition, swiftly pulled back on the skin to reveal its rotting insides. A waterlogged crop is unable to bear fruit. And it wasn't only the corn that was ruined, but the cassava, papaya, yams, pineapple, peanuts, and pumpkins—all of the food grown on the farm.

As Janki built her third case against Exxon, DeFreitas became an eager participant. Pointing to the benefits of solar power and the minimal use of fossil fuels in his community, he knows that other, less harmful ways of producing energy are possible. Beyond this he looks at the implications of exacerbating the climate crisis and considers Exxon's operations not only crazy but wrong. "I just don't see the point," he says.

In May 2021, with Thomas and DeFreitas as plaintiffs, Janki, joined by Burch-Smith, filed the landmark suit against the government and Exxon. "The earth's atmosphere and oceans have been and continue to be polluted by the release and accumulation of greenhouse gases," the lawyers state, resulting from "the production, transportation, refining and use of fossil fuels." Therefore, the government's approval of Exxon's operations, they argue, violates the constitutional right of current and future Guyanese citizens to an environment that is not harmful to their health or well-being. It is the first case in which this provision has been litigated.

Thomas' affidavit, which says that the "existential threat" caused by greenhouse gas emissions is already harming the health and well-being of the Guyanese people, is the one Exxon is trying to get thrown out. "The intensity of that harm will increase as fossil fuels continue to be burned," Thomas writes, placing responsibility on the government and Exxon by noting that combustion is "the intended and foreseeable consequence of producing that oil and gas." Thomas quotes extensively from Exxon's own 1982 research, which concluded that "mitigation of the 'greenhouse effect' would require major reductions in fossil fuel combustion." But because Thomas isn't a climate scientist, Exxon argues that his statements reflect opinion rather than agreed-upon facts.





They're "not going to concede anything about climate change unless they have a gun to their head, metaphorically," Burch-Smith said about Exxon.

Scholars agree that Janki's lawsuits are creating innovative precedents for challenging the major contributors to climate change. Joana Setzer, an assistant professor at the Grantham Research Institute on Climate Change and the Environment at the London School of Economics, credits the case for advancing human-rights-based climate litigation, uniquely challenging the permitting of new oil reserves based on the harms of the resulting emissions. "If the case is successful, it could inspire similar lawsuits in other countries," she says. "It's a real human rights case."

Exxon contends that it "has complied with all applicable laws at every step of the exploration, appraisal, development and production stages" in response to questions about the suit.

In September 2021, Exxon joined the government as a codefendant, which suggests it wasn't content to let the case play out without its influence. The multinational argues that the plaintiffs have "misconceived" the Environmental Protection Act, noting that the government approved the environmental impact assessments necessary for drilling to proceed. Exxon also says the plaintiffs "mischaracterized" the constitutional provision on which Janki and Burch-Smith have built their case. Although that provision requires the state to "secure sustainable development and use of natural resources," it goes on to say that it must do this "while promoting justifiable economic and social development."

The government's response follows a similar argument. It affirms that it approved Exxon's environmental impact assessment and cites the same constitutional provision noted by Exxon. Preventing Guyana from developing its petroleum resources, the government argues, would bring "unwarranted economic and social costs." Bharrat Jagdeo, once the country's president and now its vice president, has argued that Guyana should pump its oil quickly, while it still has the chance. (He has emerged as a leader of a group of government officials in places like Suriname and Ghana who are making the same case.) Jagdeo, President Irfaan Ali, and other government officials declined repeated requests for interviews.

The government and Exxon's economic prosperity argument was dealt a blow in October 2021. The Biden administration, following a new US directive to "promote ending international financing of carbon-intensive fossil fuel-based energy," blocked a \$180 million loan from the Inter-American Development Bank to a private Guyanese company that was meant to support the expansion of Exxon's onshore facilities.

If economic prosperity is the goal, the oil project is not off to a good start. Despite three years of production, Guyana remains a struggling nation with one of the highest poverty rates in Latin America and the Caribbean. The lure of a windfall from oil is understandably tempting. And money from oil has flowed into the country, but measuring its impact is difficult. The World Bank says that "extraordinary economic growth of 20–40 percent over the last two years brought GDP per capita to over \$9,300 in 2021, from about \$6,600 in 2019." But GDP remains a questionable metric, in that it entirely ignores very real environmental costs, and those per capita figures merely divide a national value by the population—with no consideration for unequal distribution of the gains.

Exxon spokesperson Meghan MacDonald emphasized the company's efforts to add to Guyana's workforce, noting that there are more than 4,400 Guyanese workers supporting Exxon Mobil's activities there. "In frontier countries around the world, it takes some time to develop the workforce to handle the operations in a complex, highly volatile work environment," MacDonald said. It's widely known, though, that the oil and gas industry is increasingly automated and less reliant on workers—something that Exxon itself acknowledged in a statement on its website that has since been deleted.

By the end of 2021, Exxon and its partners had taken in six times more revenue from its oil operations in Guyana than the government had—\$3.6 billion to the government's \$607 million—according to the Institute for Energy Economics and Financial Analysis. Due to the lopsided contract, the group estimates that by 2027, Guyana will carry a liability of more than \$34 billion owed to Exxon and its partners to cover their development and related costs. "There isn't going to be a vast amount of wealth," Janki says. "There is going to be, most likely, an enormous bill that the Guyanese people will be saddled with."

If the court agrees with Janki that this oil operation is incompatible with the right to a healthy environment, then the government has to decide whether to stop the activity or somehow find a way to make it not violate the constitution. That may be an impossible feat, as the government might have to prove that oil production would not result in a worsening of global warming. The government may also be obliged to forgo any new authorizations for oil operations or revoke Exxon's existing licenses. Oil drilling in Guyana could even be ended entirely if it is impossible for the government to issue permits without violating the law.

"Were the court to agree that this development is in violation of the Guyanese constitution, that is obviously an extraordinarily significant find-

ing, and it would have enormous impacts on any future development of oil in Guyana,” says Muffett of the Center for International Environmental Law. “Losing access to Guyana as a result of the groundbreaking legal action there would be yet another signal that the company’s core business model is fundamentally incompatible with confronting the climate crisis. Given the huge prominence of Guyana in Exxon’s portfolio, investors are likely to listen.”

Seated at a table at the Marriott Hotel in June, Burch-Smith talked about the case with me. The American hotel chain, where rooms cost upwards of \$300 a night, has recently supplanted the Pegasus as the “place to be” in Georgetown. Burch-Smith spoke quietly, careful not to be overheard by the people at nearby tables and frolicking loudly in the pool. Many of them had Texas accents. He surmised that more Americans will be coming to the country as Exxon’s operations continue to expand.

“The fundamental problem is that the only way you’re going to slow climate change is to stop burning oil.” Exxon can’t challenge that, Burch-Smith almost whispers.



IN OR LOSE, Janki’s efforts and the case are already having an impact. Under a blazing midday sun

in June, on the eve of the court hearing, roughly 25 men and women gathered outside of Exxon’s onshore base in Georgetown to protest the company’s operations—a rare, but increasingly frequent, occurrence. The protesters fanned out along the edge of the congested four-lane highway, holding white placards with handwritten messages: “Slavery was abolished centuries ago.” “Stop raping our country.” “Exxon make more money than God & Guyana gets nothing.”

In July, 23 years after Janki wrote it into Guyana’s constitution, the United Nations General Assembly recognized the right to a clean, healthy, and sustainable environment as a fundamental human right guaranteed to all. That has opened the door for people in any UN signatory nation to follow Janki’s lead and challenge fossil fuel operations in court by making the case that they are incompatible with these newly enshrined rights.

In September, Exxon reported a 42-gallon oil spill from a production rig, stretching 13 miles across the Atlantic. It was minor and, the company says, was isolated the following day. But such



Part of the sea wall that was built to protect the areas east of Georgetown, Guyana.



This isn’t a story of powerlessness; it’s a story of power,” Janki says.

spills are common in offshore oil production, and fears of a spill large enough to have a catastrophic effect on the marine ecosystem loom large here. “If something should go wrong out there, it definitely would affect not just livelihoods but the entire economy,” warns Sopheia Edghill, a marine conservationist at the University of Guyana.

During the hearing, the judge announced his retirement from the court, and he has yet to be replaced. Janki was also recently faced with another challenge. Burch-Smith withdrew as her co-counsel, citing “some differences in certain technical aspects.” But for Janki, there is no withdrawal. She will continue arguing the case on behalf of Thomas and DeFreitas, and she has a new legal partner to help her. The case will move forward when a new judge is assigned. And if it fails to stop Exxon, she has filed three other cases against the government and Exxon. “This isn’t a story of powerlessness; it’s a story of power,” Janki says. “This is the biggest climate change case in the world.” ■

ANTONIA JUHASZ is an award-winning investigative journalist and author who reports from the front lines of fossil fuels, conflict, and the climate crisis.

CRYPTO KEEPER

by Steven Levy

Photographs by
Julien Faure

iPod mastermind Tony Fadell made Ledger's

new hardware wallet—

a tiny vault for digital cash—flashy and fun.

Plus, with this gadget you'll never get FTX'd.



WHEN I COME TO PARIS

TO SEE TONY FADELL'S NEW device, a clean rain has washed the city and the sun is out. Fadell and I hail a taxi. When he gives the address for Ledger—a maker of hardware wallets for the cryptoverse—he speaks in French, but even after six years abroad, there's still Detroit in his voice.

At the meeting we enter, everyone is speaking English. People are sitting at a large table. On the walls are labels such as PHOTO ASSETS, VIEW FROM LANDING PAGE, USER FLOW, with big printouts taped below. Fadell strides to the front of the room.

"We've got seven weeks to pull this off," he says. "*Are we going to pull this off?*"

The people in the room say yes, they will pull it off. They sound confident, weary, but ready for the next round of work. Each person says what they have done since the last time they met. Fadell responds with questions. *What's the drop-dead date on the plastic blanks? Where's the press release? Are we recording the click-click-click? I want to hear it!*

The click remark reminds everyone, as if they needed it, that Fadell once led the team at Apple that created the iPod, with its elegant clicky wheel and revolutionary interface. He also cofounded

Nest and created its smart thermostat, which Google then acquired.

Fadell circles the room to examine the printouts, which describe the product rollout. A man with a video camera follows him, recording the moment for posterity and promotional use.

Fadell stops to examine a group of photos of the device: a hardware wallet called Ledger Stax. This gadget is a utilitarian thing. It's a physical lock for digital secrets. When you own cryptocurrency, your balance is protected solely by a private key that can be devilishly hard to keep safe. Ledger's wallets, made of steel and silicon (and, OK, plastic), act as tiny vaults, but so far they have been off-putting. Much like crypto itself. Fadell is reinventing this device, his first major design project in years. He has come to believe that by giving it the panache of the hottest consumer gadgets, he will redirect the crypto field, just as he helped kick off digital music and the smart home.

Fadell looks at photos of the credit-card-sized wallet and its innovative E Ink touchscreen. Ledger is pricing the item at \$279. That's a rounding error for those who buy Bored Apes. To add a bit of flair, the screen wraps around one side, giving it the equivalent of the spine on a book. But the photo doesn't show off the bend

Tony Fadell hangs out in the Donjon, Ledger's in-house security lab.

enough. "It's very rectilinear and 2D," he says. "Not enough spine. I'm not feeling the curve." He frowns. "And it's so dark."

David Sloo, a user experience designer who worked with Fadell at Nest, picks up on the critique. "Can we be less Darth Vader and more Rebel?"

Fadell agrees. "It's really who we are—it's all about the Empire."

His remark is a segue to the next panel, marked "MANIFESTO." A handful of slogans are taped to the glass.

Crypto is the new money.

Security is a human right.

Welcome to a new era of financial freedom.

The first touchscreen device made to protect your most valuable assets.

Fadell looks hardest at one that reads:

In [L] Stax We Trust.

He is not satisfied with the prominence of the [L], the Ledger logo, which appears in a custom military-style typeface. The brand is what people should remember. "In five years, every time you see that L you'll think *Ledger*," he says. "Like the Apple logo stands for the brand."

The comparison seems absurd. The company is nowhere near that size, its product is alien to most Earthlings, and its niche—crypto—has been undergoing months of shock treatment. Fadell seems unfazed.

"It's coming together," he says. "Forty-nine days!"

During those 49 days, the arc of crypto will bend into a dunk tank. Timing, as product gurus know, is everything. Stax might be coming at the perfect moment. It could as easily be the worst.



L
LEDGER WAS FOUNDED IN 2014 BY members of a tech collective called La Maison du Bitcoin. They wanted to build a wallet for crypto purists. These people would never leave their private keys on a phone or laptop—too hackable—or park their holdings in an exchange, which is a trusted, centralized institution and no better than a bank. (“Trust” is a pejorative in this world.) That was the year thousands of people lost their investments in a hack of crypto’s flagship exchange, Mt. Gox, wiping out many customers’ life savings.

Ledger’s savvy consumers would entrust their keys only to a hardware wallet, something they could hold in their hands even when servers went down and exchanges went bust. You’d begin a transaction on a phone or laptop and use the wallet to verify it. Your private key, marooned on its Alcatraz, would never cross the gap to those less secure devices.

The company’s first wallet, released late that year, was nothing special. But it satisfied a need among some crypto folk. Subsequent models got tiny displays. Ledger ultimately sold more than 5 million of its wallets, which it says now secure 20 percent of the world’s crypto and more than 30 percent of NFTs. True believers wear Ledger wallets around their necks.

By 2018, however, the crypto market had plunged into one of its cold spells, and Ledger’s sales were flat. An early investor named Pascal Gauthier came to believe that a fusty mentality was hindering the company’s growth. “The French engineer decides everything, which is why the French always come up with innovations, but we’re shitty at taking them to market and making it a business,” he says. He became part of a boardroom uprising that put him in charge.

Gauthier, who had worked in ad tech (first at Yahoo and then as COO of a successful French company called Criteo), wanted Ledger to go from selling to the “B to G” market—business to geek—to appealing to the wider, nontechnical world. He wanted to mix Ledger’s rigid security focus with the verve of Steve Jobs-level creativity. “Maybe it’s delu-

sional,” says Gauthier, who dresses as if awaiting a Sun Valley invitation, in an ever-present black Patagonia vest. “But I want to build things at scale, to build a company in Europe that will compete with Apple, Google.”

He felt Ledger needed to shake off a bit of its Frenchness. “If you want marketing and sales, you need Americans,” he says. “There is no other way.”

Gauthier started by wooing an expatriate he’d befriended. Ian Rogers is an Iggy Pop-ish 50-year-old with long blond hair, tattoos on his fingers, and a résumé loaded with trophy jobs, albeit trophies seldom found in the same case. He played in a high school band called Albino K-Mart Shoppers, was webmaster for the Beastie Boys, CEO of Beats Music, cofounder of Apple Music, and digital czar of the luxury-brand juggernaut LVMH, a gig that brought him to the City of Lights.

By 2020, though, he was open to Gauthier’s pitch. He’d long been interested in crypto, having read the foundational Satoshi paper in 2009. Gauthier was offering him a chance to participate in what he regarded as a nascent revolution of ownership, anchored by the Gibraltar-like certainty of cryptographic private keys. “We know this technology will matter in the future, because a lot of humanity, if not all of humanity, will own digital items,” he says. “It’s just like it was in 2008, when people said not everyone would have a smartphone.”

He also respected the business model—Ledger sold actual devices, not dicey promises of perpetually rising markets. For him, private wallets embodied the decentralized ethos at



the core of the crypto vision. “The people at this company wouldn’t work at Coinbase,” Rogers says. “They don’t want to work at a bank. They believe in self-custody.”

Still, Rogers wanted to do his due diligence. Fadell, a parent friend from his children’s school in Paris, took it upon himself to investigate. At that point Fadell was living a quiet life as an investor. During the first months of the pandemic it was a super quiet life. “Tony never crossed the fucking transom of his door,” Rogers says. Fadell was busy giving product advice to the companies he funded and writing a business book that drew on his career, a pursuit usually signifying a career’s end. But Rogers had gotten him curious, so he took a hard look at what the company considered its biggest strength—its security.

Fadell’s guide to Ledger’s operations was its chief technology officer, Charles Guillemet, who joined the company in 2017. Inside its headquarters, behind a giant medieval-style door off a Paris lane, Guillemet created the Donjon, a jacked-up security lab that verifies the resilience of every aspect of the hardware, down to the chip circuits. Inside

the Donjon, motherboards get probed as if in a 21st-century version of Frankenstein’s lab. Lasers connected to oven-sized oscilloscopes poke at chips to observe how they might fail. Guillemet told Fadell he was appalled at the idea of people securing their assets on laptops or iPhones, which he deemed hopelessly vulnerable. He despised fingerprints and facial recognition. Your biometrics are public, after all, and can be counterfeited.

The more time Fadell spent with Guillemet and the Ledger team, the more convinced he became. “I didn’t believe in all that crypto hype, but I believe in the technology,” he says. He told Rogers that Ledger was the real deal. Rogers became the company’s chief experience officer in January 2021, and later that year, to bolster the company’s storytelling acumen, he hired an editor in chief, former Vice executive Ariel Wengroff. She oversaw a crypto education project called Ledger Academy and kicked off a podcast and video series. Some of the engineers at Ledger didn’t understand why those nontechnical hires were necessary. Gauthier saw their resistance as part of Ledger’s problem. “I was saying we could sell tens of millions of devices, have billions of revenue, billions of valuation.

And they were like, ‘Yeah, whatever.’”

But Rogers’ most significant contribution might have been igniting the interest of his friend Fadell. Fadell had seen a weakness in Ledger’s plan—the device itself was unlovable. To unlock the wallet, you had to enter a four- or eight-digit passcode using an incredibly awkward interface, like writing an essay on a home security panel. He began pondering what a better solution might be.

Fadell met with Gauthier at a Paris café, and they agreed that Ledger needed its next product to have broader appeal. They parted ways, but Fadell kept brainstorming. When he hit on a vision, he met with Gauthier again. “I want to be the chief designer on that,” Fadell told him. Gauthier immediately agreed.

“I didn’t believe in

all that crypto hype.

but I believe

in the technology.”

Fadell says.

Ariel Wengroff joined Ledger to help spread the gospel of self-custody.

Ian Rogers, the chief experience officer and a former digital music executive, got curious about crypto and started collecting NFTs.



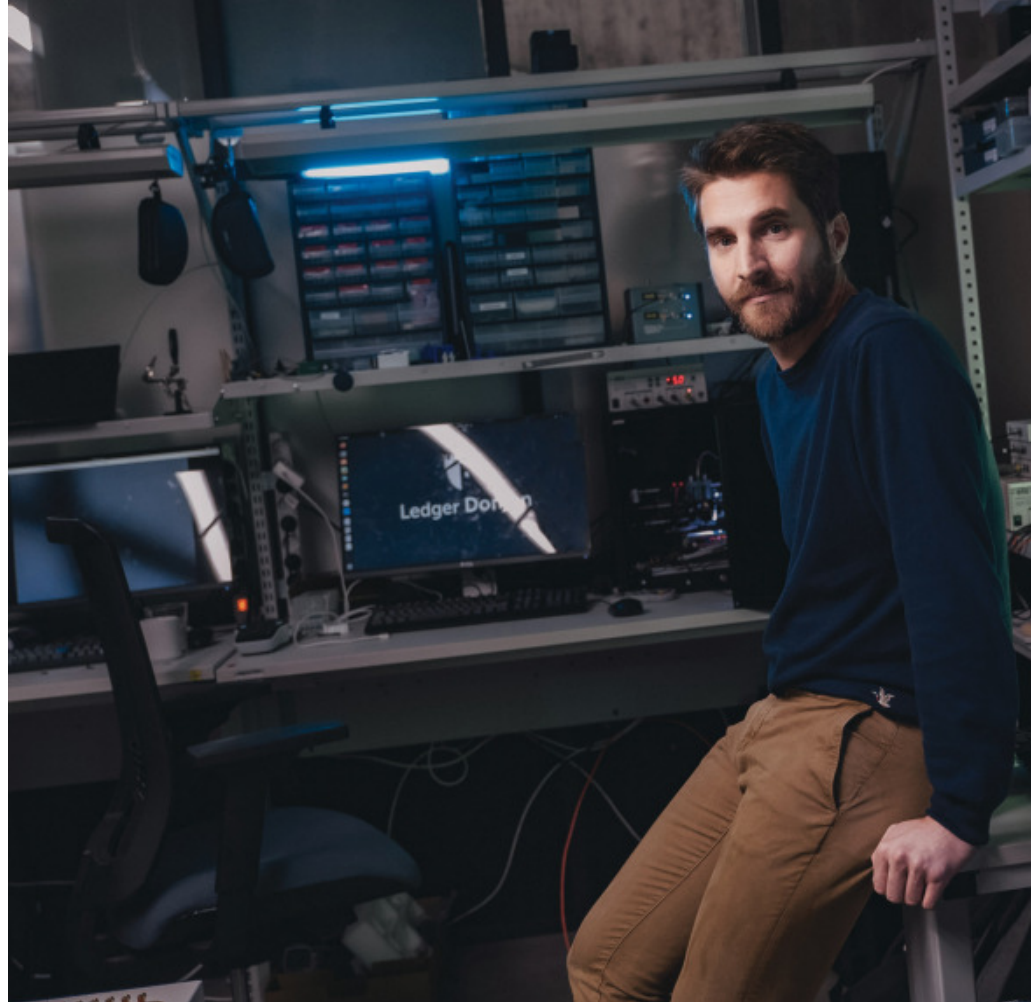
F

FADELL STARTED THE GIG FULL of ideas. As the guy who swept away the pain points of first-generation MP3 players (big and clunky, engineering degree required to select a song) and thermostats (ugly, no connectivity, impossible to program), Fadell was quick to understand the shortcomings of Ledger's wallet. Its screen was tiny, it lacked a keyboard or keypad, and its appearance and charm were on par with an early-2000s USB stick. The startup instructions warned users to set aside a minimum of 30 minutes.

In his mind, the wallet should be about the size of a credit card and have a touchscreen. The setup time should take no more than three minutes. You should be able to personalize the lock screen to display anything you want. He also envisioned people owning several wallets, one for each category of digital collecting or banking. He liked the concept of stacking them on top of each other, like a cash bundle of \$100 bills. He came up with the idea of having magnets to snap the units into a tidy stack. That feature provided the name for the device: Stax.

Fadell surveyed all possible electronic components, talked to suppliers, and began prototyping, using green plastic toy blocks and magnets. One design constraint was battery life—Fadell wanted people to be able to leave their wallets untouched for months and still have power when they retrieved them. That meant the screen had to use energy-efficient E Ink. (Color would have been nice, but the tech isn't there yet.) Fadell took apart a bunch of Kindles and ReMarkable tablets to test how the screen might display a keyboard and other buttons.

One of his dreams was to extend the screen along the edge of the unit, so people could label it. None of the E Ink displays he saw could do what he wanted, so he contacted an old friend, the UK venture capitalist Hermann Hauser, who had once been involved in an unsuccessful ebook device with advanced E Ink. That company, Plastic Logic, was now



based in Dresden, Germany, and was making custom E Ink displays. And they could bend! The curved display had at that point been used only by an obscure Russian phone called the YotaPhone. Fadell wanted to produce hundreds of thousands of screens with a dramatically sharper curve and at a low cost.

Adding a touchscreen to the wallet presented a risk, though—a sophisticated attacker could, with the right equipment, pick up electronic signals leaking through the screen and figure out the pin code that unlocks the device. So Ledger's engineers had to shield the screen so it emitted no digital exhaust. They also wrote their own driver, the code that helps render pixels on the screen. "You're compromising security if you use a driver written by someone in China that you've never met," Rogers says.

Meanwhile, Fadell was increasingly showing up at Ledger as the de facto lead of its new flagship product. (Though he never became an employee, Fadell says he was granted significant equity.) Not everyone welcomed him. Put magnets on a hardware wallet? Add a curved screen? From a supplier who'd never done that

Charles Guillemet, the CTO, told Fadell he was appalled at people who kept their private keys on a laptop or phone.

before? Plus, Fadell can be exacting to the point of infuriating. "I can't tell you how many times they'd say, 'Oh, this seems difficult—a rolled screen?'" Fadell says. "And I'm like, 'I'm telling you, we're going to do this thing. How many times do I have to say, just trust me, it's going to happen.'"

Early on, Gauthier had to convene his engineers and quell a possible rebellion. "They were saying all those things had never been done before. And I'm like, *Shut the fuck up*. If he says we're going to do it, we're going to do it." Apparently, they bought in: Some of those engineers described Fadell's style to me much the way he likes to be viewed—grueling, but inspiring. Like his former boss Steve Jobs. (Maybe if I spoke French I could have cornered them and gotten more candor.)

Ledger saw other benefits of having Fadell on board. Early in 2022, Foxconn,



the manufacturer that Ledger retained to assemble the Stax units, said that it was going to miss its February 2023 deadline for shipping final products. Maybe June? “We were freaking out,” Gauthier says. Fadell told him, “I got this.” He wrote to Foxconn’s CEO, explaining that the deadline was important and it would be a great favor if he looked into it. “Fifteen minutes later, boom, we were back on track,” Gauthier says.

W

WHEN I ARRIVE IN PARIS IN OCTOBER, the first prototypes are finished, and the team is working out the remaining bugs. Sitting with Fadell and Wengroff in Rogers’ apartment in the Marais section—a fourth-floor walk-up accessible through an unmistakably Parisian courtyard—several units are neatly, um, stacked on the table, alongside a plate of fresh croissants. On the spine of one of them is the phrase **BANKS ARE DEAD**. I watch as Rogers buys an NFT. He does the actual selection and transaction on a

As we sit in Rogers’

sunny Paris flat,

it all seems plausible.

Less than a month later,

the blockchain world

would blow up at

the hands of a

bogus crypto king

in the Bahamas.

phone. The Stax wakes up when it’s time to verify Rogers’ private key, alerting him that a pending transaction awaits his verification. Punching in his passcode on the display—sheltering with a cupped hand so I can’t shoulder-surf—he buys it. Within a few minutes, he can view the image on his phone and edit it so it shows up in gray scale when he ships it to the lock screen of his Stax.

It may be a stretch to imagine a mass movement toward crypto coins and digital goods. Ledger’s very long-term vision is that with secure, well-designed hardware as a bedrock, people will gravitate to crypto to verify their identity and credentials. Think driver’s licenses, passports, proof that you passed your dentistry boards, Taylor Swift tickets, and voter ID. Rogers says that when he attended the NFT NYC conference in June 2022 and digitally verified he had the token required to register for exclusive events, an irony struck him. “The technology I use to get into parties is more secure, easier to use, and better than the technology that I use to get into our country! Fast-forward into the future and your government document is in your hardware wallet.”

To advance this vision, Ledger has so far met only with consultants from Estonia, a nation known for embracing any futuristic scheme that comes its way. A cool wallet can only do so much; it’s not going to win over people who struggle through 40,000-word crypto explainers in allegedly plain language and still can’t figure it out. Does Ledger really think it can transform the industry?

“That’s the hope,” Fadell says. “To have that iPod moment for digital assets.” He has concluded that a hardware wallet is inevitable: “You can’t just integrate it into a phone, no matter how much you try. You need to have a real physical key in your life that holds the digital.”

As we sit in Rogers’ sunny Paris flat, it all seems plausible. Less than a month later, the blockchain world would blow up at the hands of a bogus crypto king in the Bahamas.



^

Stax wallets have wraparound touchscreen displays and magnets that let users snap together the little booklet-shaped gadgets.

those same words, the phrase became a signal that a house of cards was falling and your assets were gone.

If even savvy crypto folk get panicky at a hiccup like that, just imagine the reluctance of Web3 holdouts. Might it be unrealistic for Ledger to expect newbies to pay almost \$300 for a wallet that has a fun picture on it but still depends on a somewhat impenetrable ecosystem and an existential question of reliability?

To the Ledger-ites, the promise of crypto and the necessity of self-custody will prevail. It's a logical outcome of the last half-century of atoms moving to bits. Still, Rogers admits that no matter how slick Stax is, it interacts with systems that have massive barriers to entry.

After breakfasting at the bistro, I spent an hour with him trying to get set up to trade crypto and buy NFTs. While getting the wallet to authenticate me was easy, getting the currency needed to buy the funky artworks Rogers likes proved frustratingly difficult, and apparently impossible to complete in the time we had. "Crypto is where the internet was in 1993," he finally said, in a tone somewhere between wistful and pissed off. That doesn't bother him too much—the iPod, after all, came out in the early, awkward days of digital music and took a few years to catch on. "The only question in my brain is, are we the Apple of Web3?" Rogers says. "Or are we the BlackBerry or Nokia of Web3?"

We've already seen the FTX of Web3, so there's nowhere to go but up. For now, Tony Fadell's latest technology tour de force stands as a friendly hardware ambassador for a future that's still far away for most of us, and a glimpse of how we might wind up with something useful, accessible, and enriching—from what so far has been a blockchain of fools. ■

STEVEN LEVY (@stevenlevy) is WIRED's editor at large. He wrote about Meta's Oversight Board in issue 30.12/31.01.

IN EARLY NOVEMBER, GAUTHIER, ROGERS, FADELL, and WENGROFF visited New York City, and we met in a downtown bistro. As the espressos were being pulled, I asked about the fuzzy-haired, short-pants elephant in the room. Only a week earlier, a young crypto magnate named Sam Bankman-Fried had presided over the biggest disaster in crypto since Mt. Gox. "SBF" had allegedly redirected a chunk of customer deposits from his multi-billion-dollar crypto exchange FTX to cover the failing high-risk investments handled by a trading company he controlled. When customers went to withdraw their funds, some of them discovered they couldn't. His crew had annihilated at least a billion dollars' worth of wealth, stiffing more than a million customers and demolishing crypto's reputation.

The implosion capped off a convulsive year. The prices of cryptocurrencies have sunk, and NFTs have gone from galleries to Goodwill. Considering all this, launching Stax now could seem like introducing a new cocktail in the lounge of the *Titanic*, just as the ship smacked into the iceberg.

"Non, non!" insist the folks at Ledger. They say that FTX has been a *boon* for their company. It was a vindication of self-custody. People who had been holding their digital assets inside exchanges were now pulling out their funds and moving them to hardware wallets. The previous day, a Sunday, Ledger had set a sales record, and now it was on track to break it again.

As customers poured in—and existing users who hadn't fired up their wallets in months suddenly decided to update the firmware—Ledger's servers were temporarily swamped, and for an hour or so, customers couldn't update their software. Some got spooked. The company's support team sent out an ill-worded message assuring everyone, in a tweet, "Your assets are safe." Of course they were—that's what self-custody is all about. But after Bankman-Fried uttered

COLOPHON

Second Acts That Helped Get This Issue Out:

Going back to *The Power Broker* after being stuck on page 261 for months; finding a pair of glasses I thought got lost in the move; the thriving subeconomy of abandoned furniture, rugs, and appliances on the sidewalks of Berkeley; dusting off some board games to play with old friends; finally watching *Frozen 2* and confirming that no one needs to watch *Frozen 2*; taking out my neglected baking books and getting my hands into some dough; Pax-lovid; picking up knitting again; my stray cat friend returning after a week of absence; being reminded that my friends are family; my toddler helping me rediscover the rapture of prancing; stealing some solitary hours to finally watch *2001* by myself, then starting it over after my youngest daughter walked in on the ending and was mystified, then starting it over again when she wanted to show it to her big sister; *Led Zeppelin II*.

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THE ASSIGNMENT: IN SIX WORDS, WRITE A STORY ABOUT AN ANIMAL THAT HASN'T BEEN DISCOVERED YET.

STRANGELY, IT WANTED TO BE CAPTURED.

—@JayZheng10, via Twitter



Honorable Mentions

Its stare gave me a rash.

—@dantekienigiel, via Instagram

Darwin might've overlooked them on purpose.

—@the__story__life, via Instagram

Green trunks wiggled from thawed permafrost.

—@Theniceladywit, via Twitter

Field biology got trickier after that.

—Paul Gazis, via Facebook

We thought lenticular clouds were clouds.

—@marcia_storyteller, via Instagram

Its unusual diet was immediately demonstrated.

—@lauren.samuelson14, via Instagram

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